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11 Jan. 1897

OFFICE OF NAVAL INTELLIGENCE,
PART I: GENERAL INFORMATION SERIES, No. XVI.

INFORMATION FROM ABROAD.

NOTES

ON

NAVAL PROGRESS.

OCTOBER, 1896.

NAVY DEPARTMENT,
OFFICE OF NAVAL INTELLIGENCE.

WASHINGTON:
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1896.

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INTRODUCTION.

The Secretary of the Navy has directed that the information from abroad shall be published in parts, each part being published whenever sufficient information is collected to warrant publication. The parts when bound together will form the annual Notes on the Year's Naval Progress.

In this manner it is intended to place the information before the service at the earliest possible date and at the same time to retain the annual as a book of reference.

The notes on ships, torpedo boats, ordnance, and armor contain the information received since No. XV was sent to the Government Printing Office.

RICHARD WAINWRIGHT,
Chief Intelligence Officer.

NAVY DEPARTMENT, *October, 1896.*

I.

NOTES ON SHIPS AND TORPEDO BOATS.

By Lieut. H. M. WITZEL, United States Navy,
Staff Intelligence Officer.

ARGENTINA.

TORPEDO BOATS.

SANTA FE.

(Page 14, No. XV.)

This torpedo boat, brought to her load water line by a load of 35 tons, had an official three hours' full-speed trial on July 9, 1896, during which a mean speed of 26.5 knots was obtained.

AUSTRIA.

STEAM TRIALS.

MAGNET.

(Page 16, No. XV.)

This torpedo vessel had a three hours' forced-draft trial early in July, 1896, during which a mean speed of 26 knots was obtained. Displacement, 510 tons.

Motive power.—Two triple-expansion engines of 6,000 I. H. P.; four boilers.

TORPEDO BOATS.

NATTER.

(Page 17, No. XV.)

This torpedo boat, in a three hours' trial and carrying 26.2 tons additional weight, attained a mean speed of 26.5 knots.

BRAZIL.

VESSELS LAUNCHED.

BARROZO.

(Page 18, No. XV.)

The first of the three protected cruisers, building by Messrs. Armstrong, Mitchell & Co., was launched on August 25, 1896, and named the *Barrozo.*

CHILE.

STEAM TRIALS.

ALMIRANTE SIMPSON.

(Page 22, No. XV.)

The official speed trials of this torpedo vessel were held on July 23, 1896. The mean speed of six runs over the measured mile was 21.5 knots; of the three hours' forced-draft trial, 21.25 knots. The six hours' natural-draft trial gave a mean speed of 17.75 knots.

DENMARK.

VESSELS PROPOSED, AUTHORIZED, AND BUILDING.

HERLUF TRALLE.

The plans of a new coast-defense vessel of about 5,000 tons displacement, to be named the *Herluf Tralle*, have been approved. Its construction will soon be begun at the royal dockyard at Copenhagen.

FRANCE.

VESSELS PROPOSED.

Proposals are invited for the construction, at a private yard, of one protected cruiser of 5,300 tons displacement and a speed of 23 knots.

Two sheathed cruisers of 2,450 tons displacement and a speed of 20.5 knots are to be built; one at Rochefort, the other at a private yard.

VESSELS LAUNCHED.

SAINT LOUIS.

(Page 45, No. XIII; 29, No. XV.)

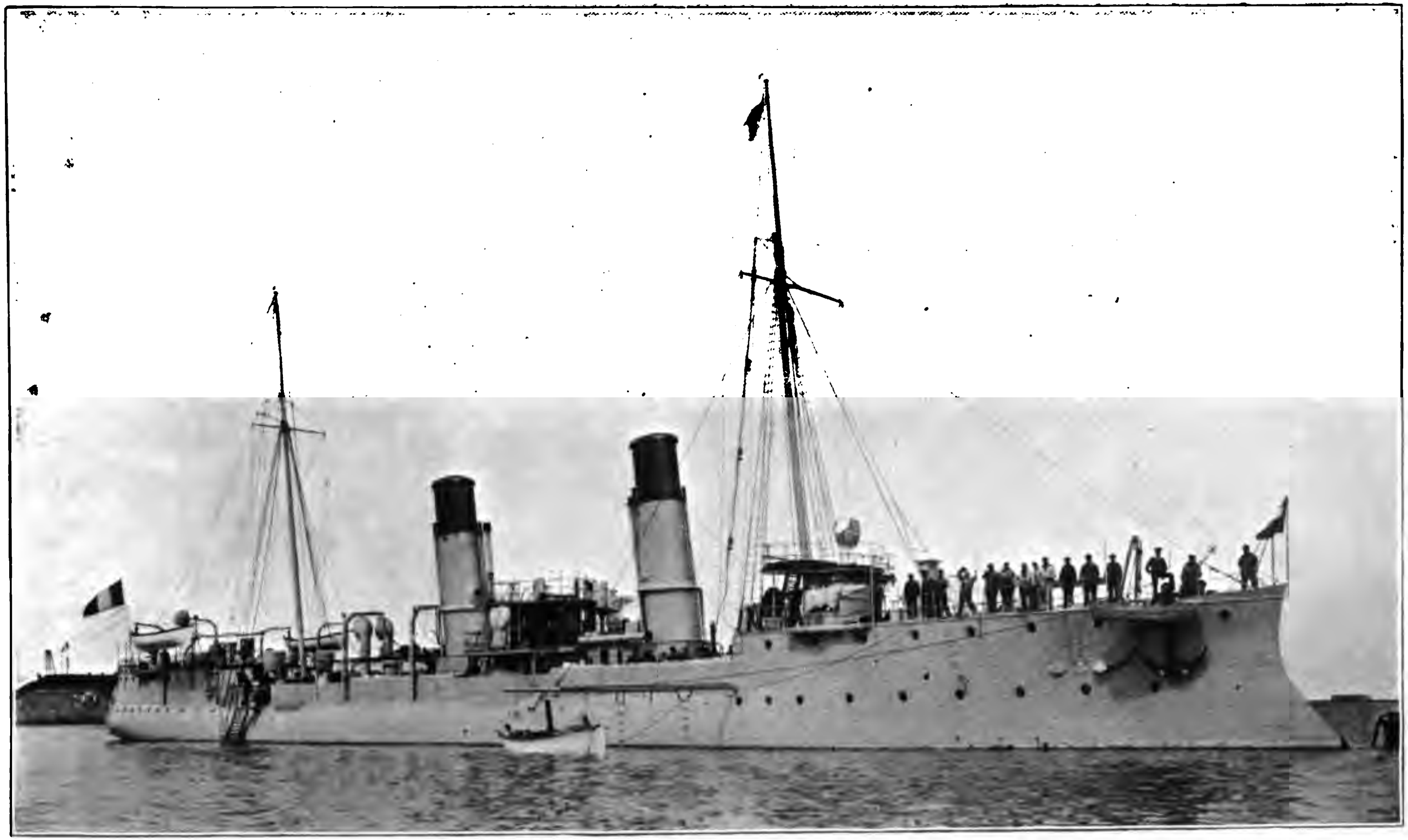
This battleship, sister ship of the *Charlemagne*, was launched at Lorient on September 8, 1896.

STEAM TRIALS.

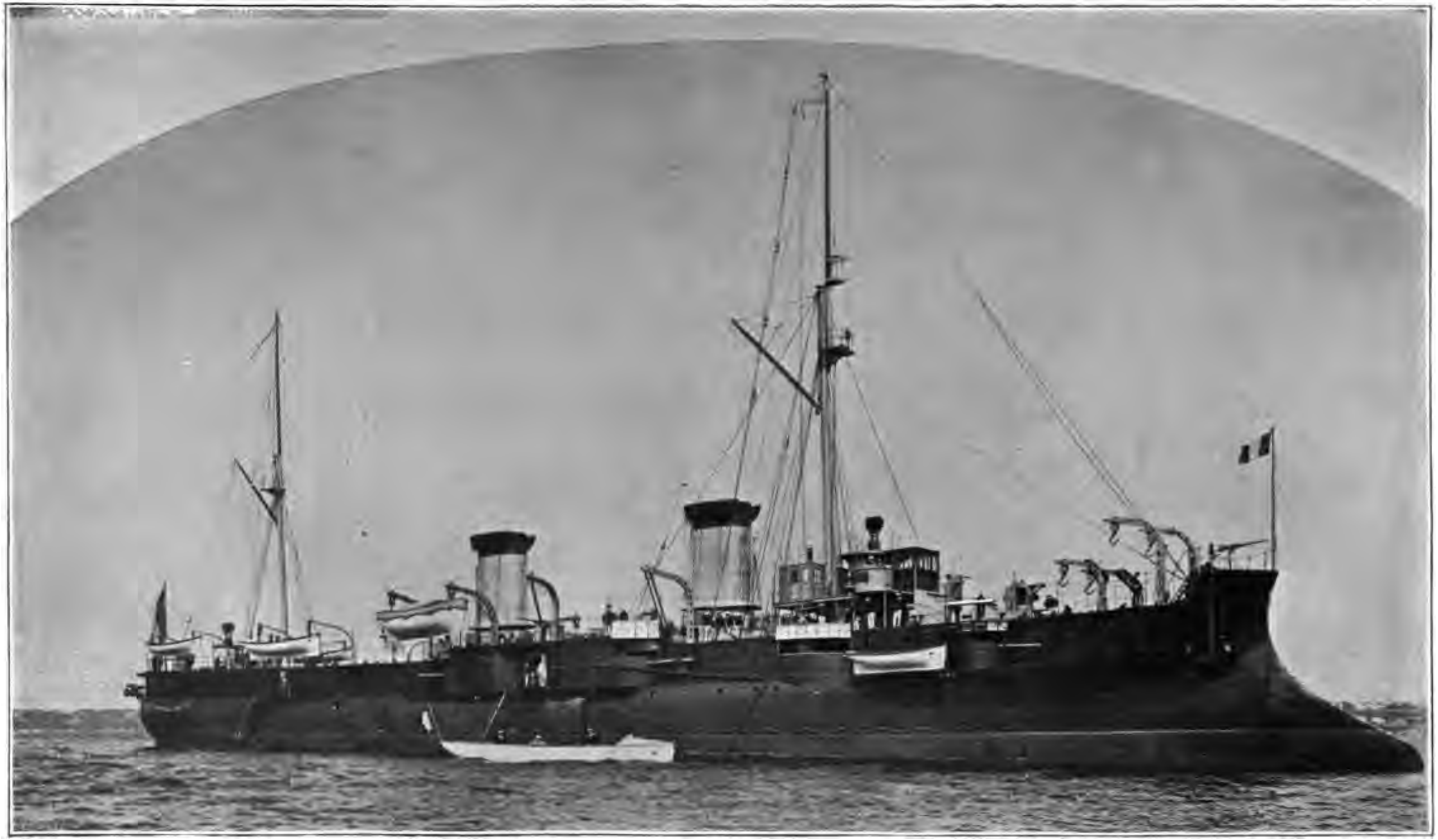
BRUIX.

(Page 21, No. XIV.)

In a preliminary natural-draft trial off Rochefort, in July, 1896, the engines developed 7,210 H. P.



CASSINI. (Page 38, No. XV.)



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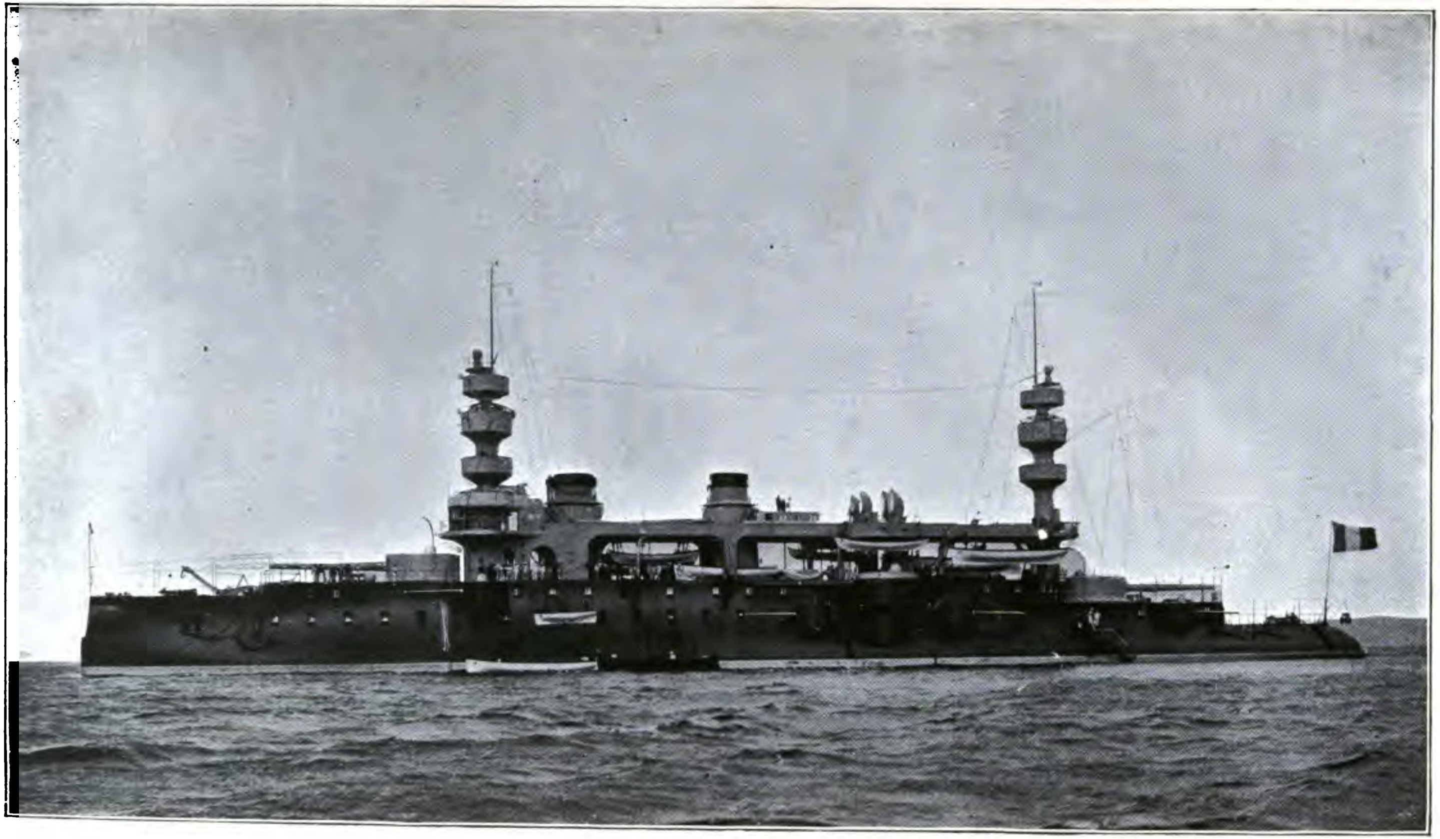

CHARLES MARTEL.

CHARLES-MARTEL.

(Page 36, No. XV.)

In an official reduced-power trial off Brest, on August 11, this vessel attained a mean speed of 10.6 knots; I. H. P., 2,150; coal consumed per I. H. P. per hour, 1.7 pounds; number of revolutions, 52.5. On August 14, with 1,050 I. H. P. and 39.5 revolutions, she attained a speed of 8.3 knots; coal consumed per I. H. P. per hour, 1.92 pounds.

DESCARTES.

(Page 37, No. XV.)

A series of reduced-power trials gave the following results:

August 11: I. H. P., 915; number of revolutions, 62; coal consumed per I. H. P. per hour, 1.69 pounds; speed, 10 knots.

August 14: I. H. P., 1,725; number of revolutions, 83; coal consumed per I. H. P. per hour, 1.39 pounds; speed, 13.5 knots.

August 19 (10-knot trial with one engine): I. H. P., 890; number of revolutions, 74; coal consumed per I. H. P. per hour, 1.53 pounds; speed, 10.2 knots.

VESSEL RE-ARMED.

REQUIN.

(Page 39, No. XV.)

The *Requin* is the only vessel of her class that will be re-armed. The expense of the change is considered too high for the advantages gained.

VESSELS STRUCK FROM THE LIST.

The *Bobillot*, *Cuvellier*, *Raynaud*, and *Triomphante* are struck from the list of "bâtiments de mer" and put on the first part of the "Liste de la flotte." The *Béliers* and *Villars* are struck from the first part of the "Liste de la flotte."

GERMANY.

TORPEDO BOATS.

(Page 50, No. XV.)

The torpedo division boat building by Thornycroft will have twin screws, driven by two independent engines.

GREAT BRITAIN.

VESSELS AUTHORIZED AND BUILDING.

CANOPUS AND CLASS.

(Page 51, No. XV.)

The five vessels of the *Canopus* class are to be named *Canopus*, *Ocean*, *Goliath*, *Glory*, and *Albion*. The first is to be built at Portsmouth, the second at Devonport, the third at Chatham; the *Glory* will be built by

Messrs. Laird Bros., and the *Albion* by the Thames Iron Works and Shipbuilding Company.

The contract for the propelling machinery of the *Canopus* has been given to Messrs. Scott & Co., Greenock. There are to be two sets of triple-expansion engines capable of developing 13,500 collective horse-power, steam to be furnished by 20 boilers of the Belleville type. The propelling machinery of the *Ocean* will be built by Messrs. Hawthorn, Leslie & Co.; that of the *Goliath* by Messrs. John Penn & Sons; that of the *Glory* by Messrs. Laird Bros., and that of the *Albion* by Messrs. Maudslay, Sons & Field.

POMONE.

(Page 50, No. XV.)

The construction of the third-class cruiser authorized in the naval estimates for 1896–97, to be built at a navy-yard, will be begun at Sheerness on the slip of the *Proserpine* as soon as the latter is launched. The new cruiser will be named the *Pomone.*

Dimensions.—Length, 300 feet; beam, 36.5 feet; mean load draught, 13.5 feet; displacement, 2,135 tons.

Motive power.—Engines, in two compartments, of 7,000 I. H. P. under forced draft, and 5,000 I. H. P. under natural draft; eight water-tube boilers in two compartments; coal capacity, 550 tons; estimated speed under forced draft 20 knots, under natural draft 18.5 knots.

Protection.—Steel protective deck, running the entire length of the vessel, with a maximum thickness of 2 inches over the engines and boiler rooms.

Armament.—Eight 4-inch R. F. guns: Two on forecastle, two on poop, and two on each broadside; eight 3-pounder Hotchkiss R. F. guns; two Maxim machine guns, caliber 0.45; two 14-inch torpedo tubes.

VESSELS LAUNCHED.

CÆSAR AND ILLUSTRIOUS.

(Page 36, No. XIV.)

These vessels, sister ships to the *Magnificent,* were floated out of dock as follows: The *Cæsar* at the Portsmouth Navy-Yard, where her keel was laid on March 25, 1895, on September 2, 1896; and the *Illustrious,* at the Chatham Navy-Yard, where her keel was laid on March 18, 1895, on September 17, 1896.

STEAM TRIALS.

PRINCE GEORGE.

(Page 51, No. XV.)

The eight hours' natural-draft trial was carried out on September 8, 1896. Ship's draught: 24 feet 11 inches, forward; 25 feet 2 inches, aft Steam pressure in boilers, 150.7 pounds; vacuum, 25.7 inches starboard, 25.5 inches port; air pressure in fire room, 0.44 inches. Mean I. H. P., 10,464; number of revolutions, 97; coal consumed per I. H. P. per hour, 2.3 pounds. Speed, by patent log, 16.52 knots.

The four hours' forced-draft trial was carried out on September 14, 1896. Ship's draught: 24 feet 9 inches, forward; 25 feet 3 inches, aft. Steam pressure in boilers, 152.3 pounds; vacuum, 26.4 inches starboard, 26.3 inches port; air pressure in fire room, 1.2 inches. Mean I. H. P., 12,253: Starboard, 6,104; port, 6,149. Mean number of revolutions: Starboard, 101.56; port, 101.98. Speed, by patent log, 18.3 knots.

The thirty hours' coal-consumption trial was completed on September 18, 1896. Ship's draught: 24 feet 6 inches, forward; 25 feet, aft. Steam pressure in boilers, 137 pounds; vacuum, 27.8 inches starboard, 27.5 inches port. Mean I. H. P., 6,211. Mean number of revolutions: Starboard, 83; port, 82.8. Coal consumed per I. H. P. per hour, 1.7 pounds. Average speed, 14.76 knots.

VENUS.

(Page 52, No. XV.)

In the eight hours' natural-draft trial the mean I. H. P. developed was 8,204, and the average speed 19.25 knots.

In the four hours' forced-draft trial the mean I. H. P. developed was 9,774, and the average speed 20.18 knots.

In the thirty hours' coal-consumption trial the mean I. H. P. developed was 4,876, and the average speed 16.8 knots. Coal consumed per I. H. P. per hour, 1.6 pounds.

VICTORIOUS.

(Page 51, No. XV.)

In the eight hours' natural-draft trial, on August 31, 1896, the mean I. H. P. developed was 10,316; average number of revolutions per minute, 98.6; mean draught, 25 feet 8 inches; mean speed, 16.92 knots.

In the four hours' forced-draft trial, on September 2, 1896, the mean I. H. P. developed was 12,201; average number of revolutions per minute, 105.3; mean draught, 25 feet 2 inches; mean speed, 18.7 knots.

In the thirty hours' coal-consumption trial, on September 4 and 5, 1896, the mean I. H. P. developed was 6,205; average number of revolutions per minute, 86.9; mean draught, 25 feet 1 inch; mean speed, 14.9 knots.

VESSELS REFITTING, ETC.

The Admiralty have ordered the stern torpedo tubes to be taken out of all ships of the *Royal Sovereign* class.

The protected cruiser *Eclipse* (p. 56, XV) is to have her masts fitted with military tops, carrying five 3-pounder R. F. guns.

The torpedo service vessel *Skipjack* is to receive new water-tube boilers at Chatham.

VESSELS SOLD OR STRUCK FROM THE LIST.

Heroine to be sold. *Hyacinth* struck from the list.

TORPEDO BOATS.

ROCKET.

(Page 64, No. XV.)

Guards have been fitted to the after part of the hull of the *Rocket* to protect the propellers, and it has been found that they do not appreciably affect her speed. It has been decided to supply similar fittings to all vessels of the class.

SPITFIRE.

(Page 63, No. XV.)

The average speed attained by this vessel during six runs over the measured mile was 27.775 knots. During the three hours' trial the boiler pressure was 195 pounds; mean I. H. P., 4,527; mean number of revolutions per minute, 398; average speed, 27.461 knots.

ITALY.

The *Giuseppe Garibaldi II* (p. 65, No. XV) has been sold to Spain by the contractors and renamed the *Cristobal Colon.*

VESSEL LAUNCHED.

CARLO ALBERTO.

(Page 66, No. XV.)

This vessel was launched at Spezia on September 23, 1896.

NORWAY.

VALKYRIEN.

(Page 75, No. XV.)

The principal characteristics of this torpedo vessel, built by Schichau, at Elbing, are as follows:

Dimensions.—Length between perpendiculars, 190.2 feet; greatest breadth of beam, 24.3 feet; mean draught, 9.2 feet; displacement, 380 tons.

Motive power.—Two triple-expansion engines, similar to the one of the Austrian torpedo boat *Natter*, and two Thornycroft boilers carrying a working pressure of 285 pounds. Coal capacity, 90 tons.

Armament.—One 7-centimeter R. F. gun forward, one 7-centimeter R. F. gun aft, and two 47-millimeter R. F. guns in broadside. Two torpedo tubes for 45-centimeter Schwartzkopff torpedoes, one amidship and one aft.

The vessel has a ram bow. There is a low topgallant forecastle, and abaft it is the conning tower with the bridge above it. There are two pole masts, with a signal yard on the foremost. The two smoke pipes are far apart, the forward one being just abaft the conning tower.

Steam trial.—During the three hours' trial on May 11, 1896, the mean I. H. P. developed was 3,300; mean number of revolutions per minute, 240; average speed, 23.2 knots. On her passage to Horten, during very stormy weather, she proved herself to be an excellent sea boat.

PORTUGAL.

VESSELS PROPOSED.

Bids were asked for, on June 26, for the construction of one protected cruiser of about 3,600 tons, two cruisers of about 1,800 tons, and one sea-going tug of about 400 tons displacement. Bids were opened on August 26. The principal characteristics demanded are as follows:

PROTECTED CRUISER OF 3,600 TONS.

Hull.—To be of steel, wood and copper sheathed, divided into watertight compartments; double bottom at least under engine and boiler space; maximum draught of water, 19 feet 8 inches.

Motive power.—Two vertical, triple-expansion engines; twin screws of manganese bronze; water-tube boilers. Normal coal capacity, 700 tons, with bunker space for at least 300 tons additional. The mean speed during six hours' trial shall be 20 knots with natural draft and 22 knots with forced draft.

Protection.—Protective deck of soft steel, extending from end to end; minimum thickness at the crown, 1.6 inches; on the slopes, 4.3 inches. Conning tower of steel plates not less than 3.9 inches thick; gun shields, 3 inches.

Armament.—To be of R. F. guns; four 5.9-inch, eight 4.7-inch, twelve 47-millimeter, six 37-millimeter, four machine guns, and five torpedo tubes, of which three shall be submerged. The ammunition supply shall be 150 rounds for each 5.9-inch and 4.7-inch piece, and 300 rounds for each of the other pieces.

TWO CRUISERS OF 1,800 TONS.

Hull.—To be of steel, wood and copper sheathed, divided into watertight compartments; maximum draught of water, 13 feet 9 inches.

Motive power.—Two vertical, triple-expansion engines; twin screws of manganese bronze; water tube boilers. The mean speed during a six hours' natural-draft trial, in a smooth sea, shall be 15 knots.

Armament.—Two 5.9-inch R. F., four 4.7-inch R. F., eight 47-millimeter R. F., two machine guns, and two torpedo tubes. The ammunition supply shall be 150 rounds for each of the 5.9-inch and 4.7-inch guns and 300 rounds for each of the 47-millimeter guns.

SPAIN.

VESSELS PROPOSED, AUTHORIZED, OR BUILDING.

CRISTOBAL COLON AND PEDRO ARAGON.

Spain has bought of the contractors, Ansaldo & Co., near Genoa, the armored cruiser *Giuseppi Garibaldi II*, laid down for Italy (p. 65, XV), and renamed her the *Cristobal Colon*. She is to be delivered complete in February, 1897.

A contract with the same firm of builders has also been prepared for the construction of a new vessel of the same type as the above to be named the *Pedro Aragon*. She is to be delivered in fifteen months.

These armored cruisers are of the same type as the Argentine vessel *José Garibaldi* (p. 9, XIV), but instead of eight cylindrical Scotch boilers they are to have sixteen of the Belleville type.

TORPEDO VESSELS.

The torpedo vessels referred to on page 87, No. XV, have been named the *Audaz* and *Osado;* two similar vessels, authorized in the buget for 1896 (p. 84, XV), have been ordered from the same firm.

VESSELS LAUNCHED.

PRINCESA DE ASTURIAS, CRISTOBAL COLON, AND VILLALOBOS.

The *Cristobal Colon*, armored cruiser, was launched on September 16, 1896, and the *Villalobos*, gun vessel (p. 61, XIV; 87, XV), was launched during the latter part of June, 1896.

The attempt to launch the armored cruiser *Princesa de Asturias* (p. 85, XV) on September 9, 1896, was unsuccessful; another attempt will probably be made in October.

TURKEY.

VESSELS BUILDING.

The hull of the armored cruiser *Abdul Kader* (p. 62, XIV) is nearly completed, and the protected cruiser *Hudavendikiar* (p. 62, XIV) is nearly ready for launching.

SPEED TRIALS.

PELENG-I-DERIA.

(Page 94, No. XV; 62, No. XIV; 78, XIII.)

In the official acceptance-trials this torpedo vessel attained a mean speed of 20 knots over the measured mile and a mean speed of 19 knots in a three hours' trial.

Dimensions.—Length, 236 feet 2 inches; beam, 31 feet 2 inches; displacement, 840 tons.

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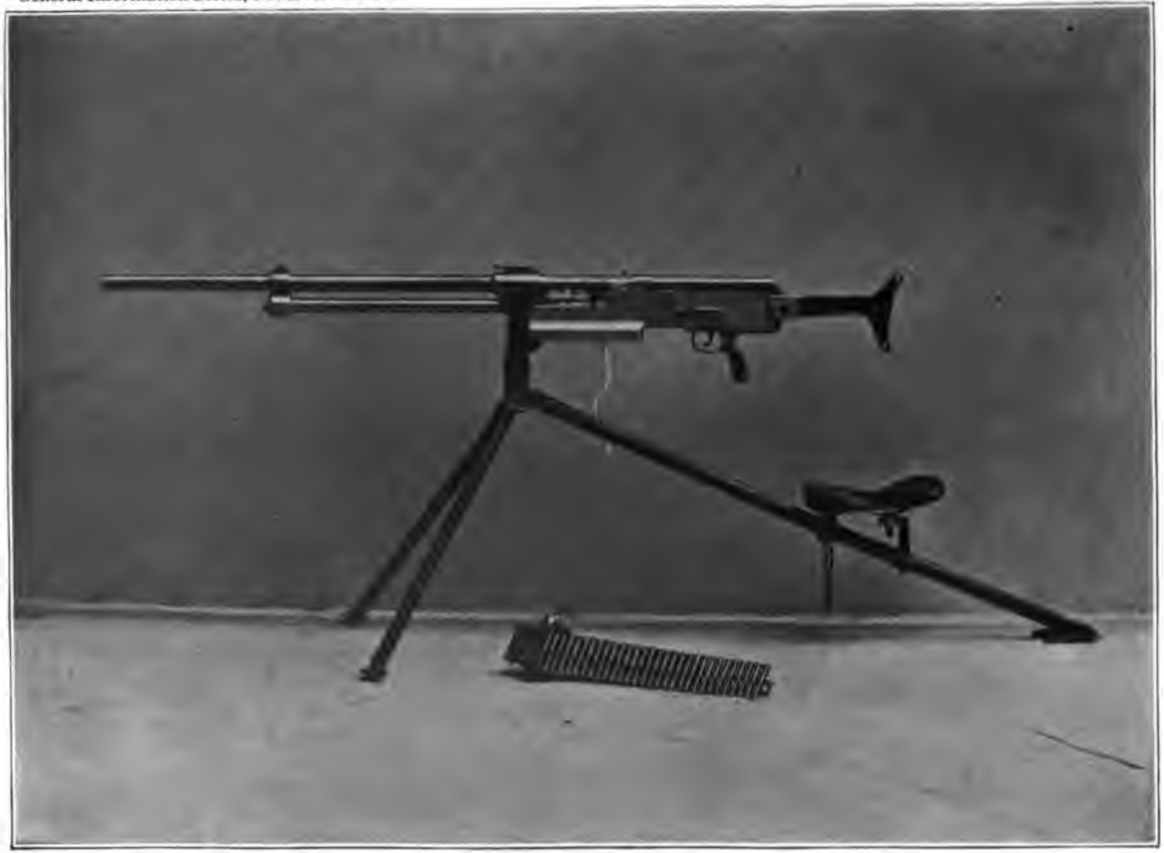


Fig. 3.—HOTCHKISS AUTOMATIC MACHINE GUN.

Fig. 1.

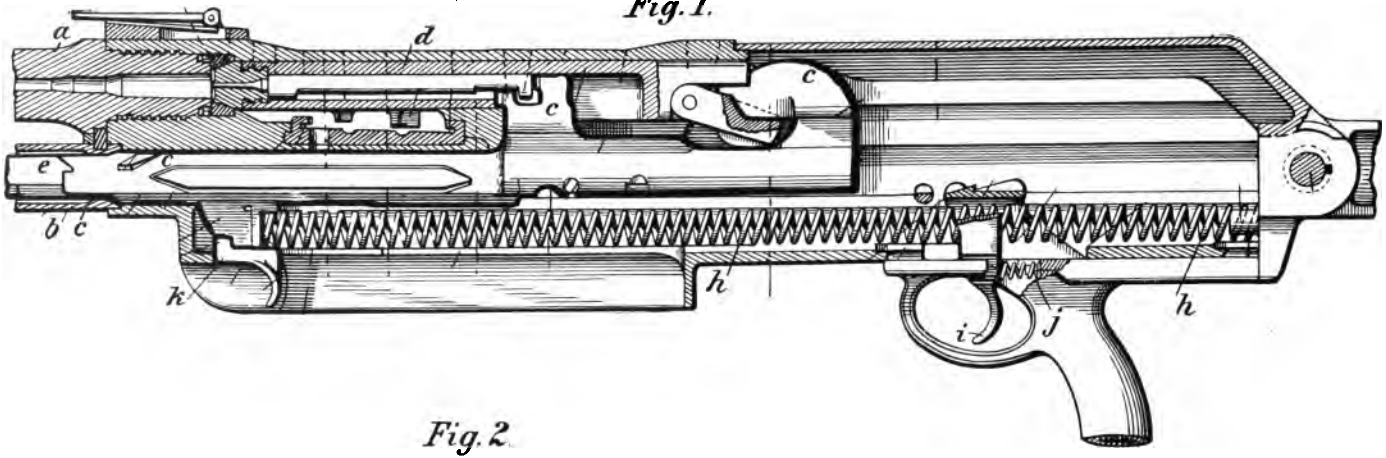
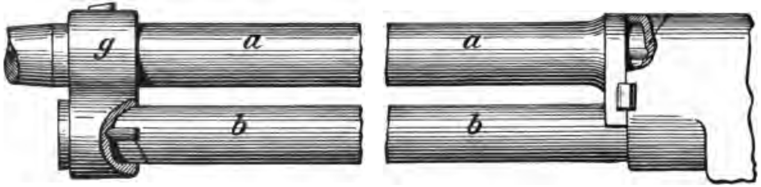


Fig. 2



Figs. 1 and 2.—HOTCHKISS AUTOMATIC MACHINE GUN.

II.

NOTES ON ORDNANCE AND ARMOR.

By Ensign Lay H. Everhart, United States Navy,
Staff Intelligence Officer.

GUNS AND MOUNTS.

FRANCE.

THE HOTCHKISS AUTOMATIC MACHINE GUN.

This gun is attracting much attention in Europe, where it is being tried by several Governments. The Chilean Government has it in actual service. Fig. 3 gives a general view of the gun.

"The Hotchkiss automatic machine gun belongs to that class in which a portion of the gas developed by the explosion of the powder charge is utilized for operating the breech action and feed mechanism of the arm; and more particularly to that class in which a motor piston in perpetual engagement with a power accumulator is operated by the gases resulting from the explosion. The present design produces a simple and efficient mechanism whereby, when a certain part of it is given a reciprocating motion by the action of the powder gas and a spring or other mechanical means, all the operations of loading, firing, extracting, ejecting, and cocking are automatically performed, and in proper sequence, and provides means whereby the rate of fire may be controlled or the action of the gun interrupted, and so to form all parts of the mechanism that they may be dismounted or assembled without the use of tools. In fig. 1 a longitudinal view of the mechanism is shown, while fig. 2 is an external view of portions of the barrel *a* and of the cylindrical chamber *b*, to which the gases are led for the purpose of operating the actuating piston within. The portion of the mechanism requiring the most careful study is the piston *c*, which operates the bolt *d*, and performs or provides the motive power for the various other reloading operations. It is provided with a forward extension at the end *e*, which enters the cylinder and acts in a manner similar to the piston of a steam engine. The powder gases are carried from the barrel to the forward end of this cylinder through a hole drilled in the connecting-strap *g*. The rapidity of fire of the gun may be regulated by a valve controlling the amount of gas passing through this hole. When the weapon is discharged the piston *c* is driven bodily backward against the pressure of the spring *h*. In the course of this movement the bolt *d* is drawn back, the firing-pin is set, and the empty case is ejected. On the return movement a new cartridge is carried into the chamber, and when the parts are locked in place it is discharged. This goes on as long as the gunner keeps his finger on the trigger *i*, but when the finger is removed, the sear *j*, which is connected with it, holds the piston in the rear position, and the further firing of the gun is arrested."

The cartridges are held in a light metallic clip, containing about 30, which is placed in a horizontal feeder at the left of the gun (fig. 1).

"In order to enable the gun to be loaded by hand when inserting the first cartridge, a finger-piece *k*, in the form of a trigger, is provided, and it extends downward from the piston to the exterior of the gun. By means of this the piston may be drawn back by hand, so as to set it in the position from which it may continue its action on the automatic principle described above."

There are but 31 parts to the gun.

ARMOR.

METHOD OF FUSING HOLES IN FACE-HARDENED ARMOR.

Ordinary drilling tools have been found useless for drilling the necessary holes for securing face-hardened armor. At first the attempt was made to keep the plate soft in the wake of holes by means of patches, but this was not wholly successful, and now the hard face is softened by an electric arc and the holes bored with an electric drill.

It has been found possible to actually penetrate the hard skin of the plate by fusing it with an electric arc. The carbon is fixed in a holder which can be moved up toward the plate to be drilled by a hand lever, and a shield is fitted above the carbon to screen the eyes of the man working the machine from the glare of the arc. The fixture can be bolted to a Rowan electric drilling machine, which consists of a drill worked by a small electric motor, the machine being held against the plate to be drilled by a pair of electro magnets excited by the same current that drives the motor. This forms a convenient arrangement, as the machine can be used for drilling the holes in the soft steel after the hard skin has been pierced.

The dynamo used for providing the current is a 400-ampere machine, working at 80 volts, and nearly all of the current is required, as experiment has shown that with smaller currents the hole is not well defined, and is larger than necessary at the surface.

The positive pole of the dynamo is connected to the armor plate and the negative to a thirteen-sixteenth-inch carbon. The holes formed by

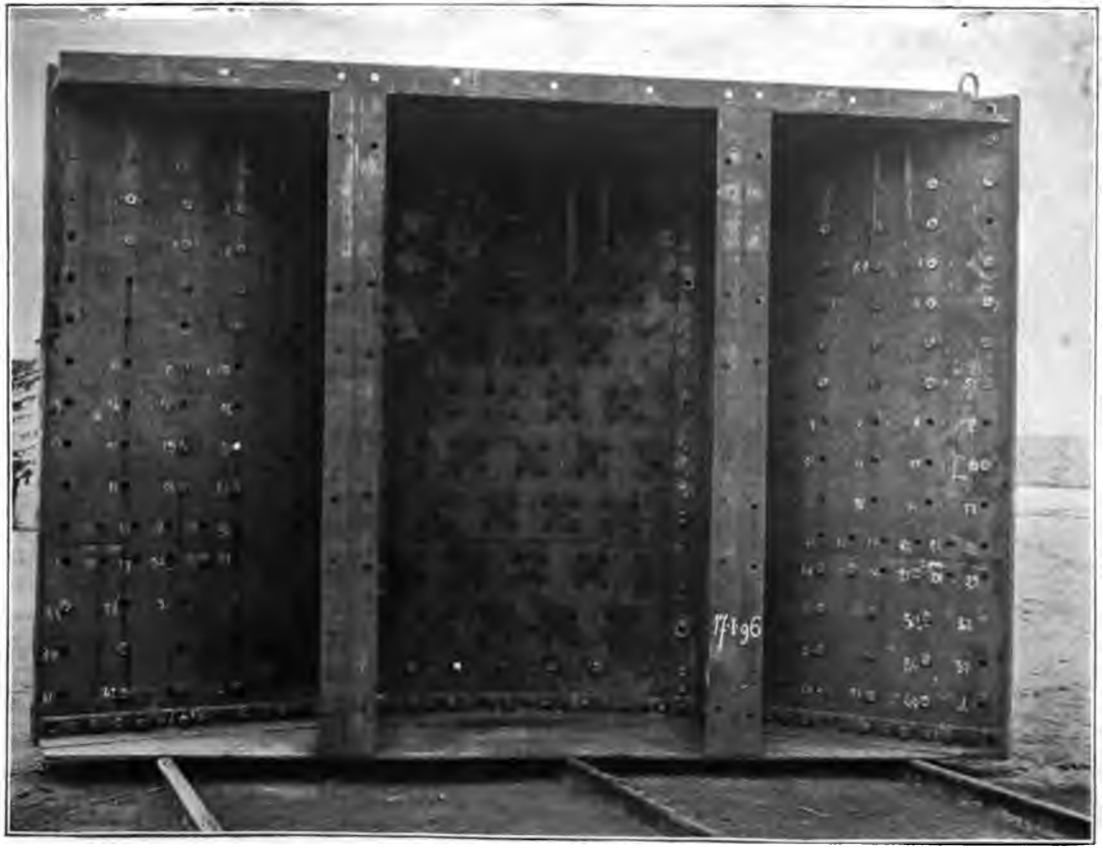


Fig. 1.

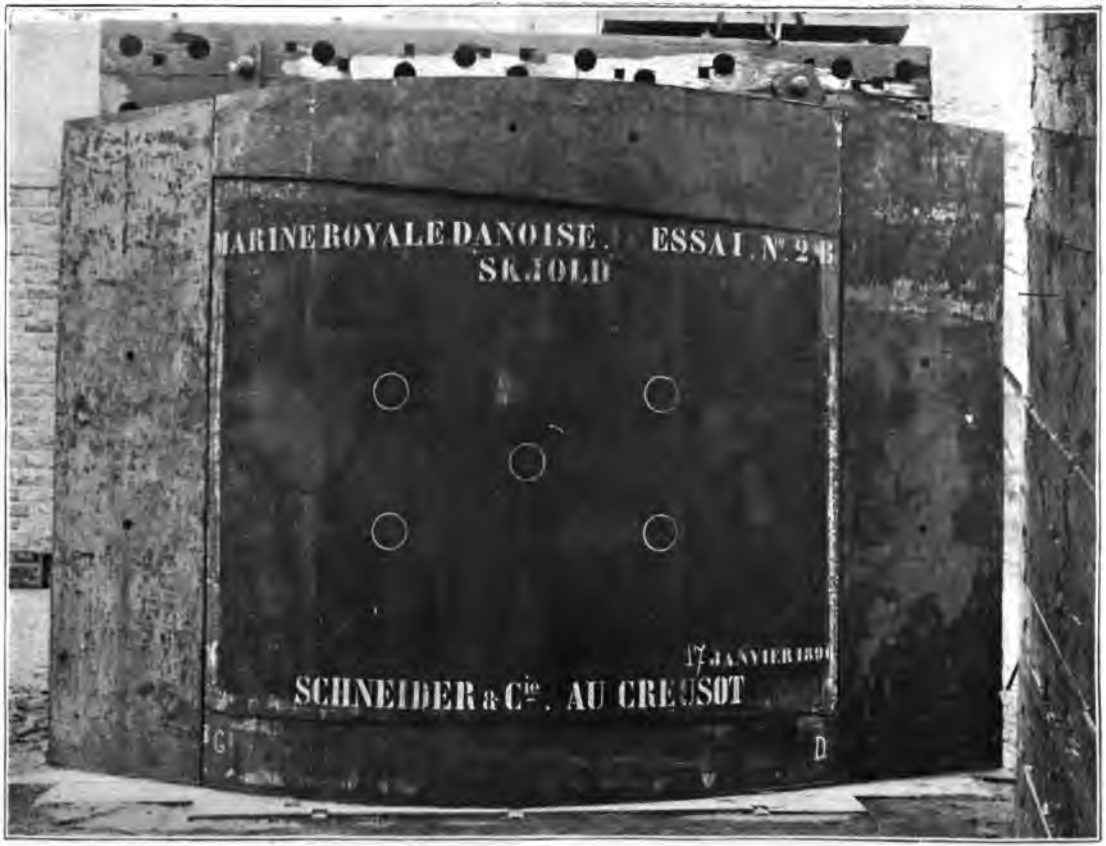

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Fig. 2.

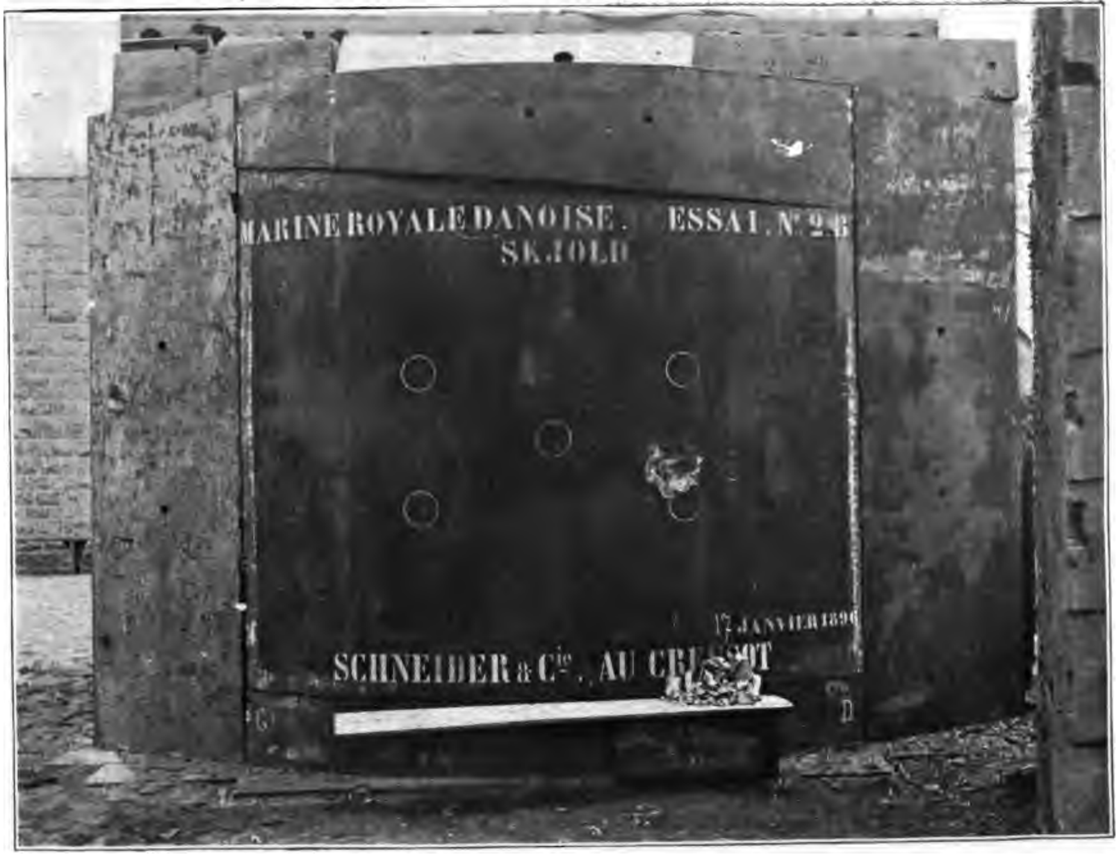
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Fig. 3.

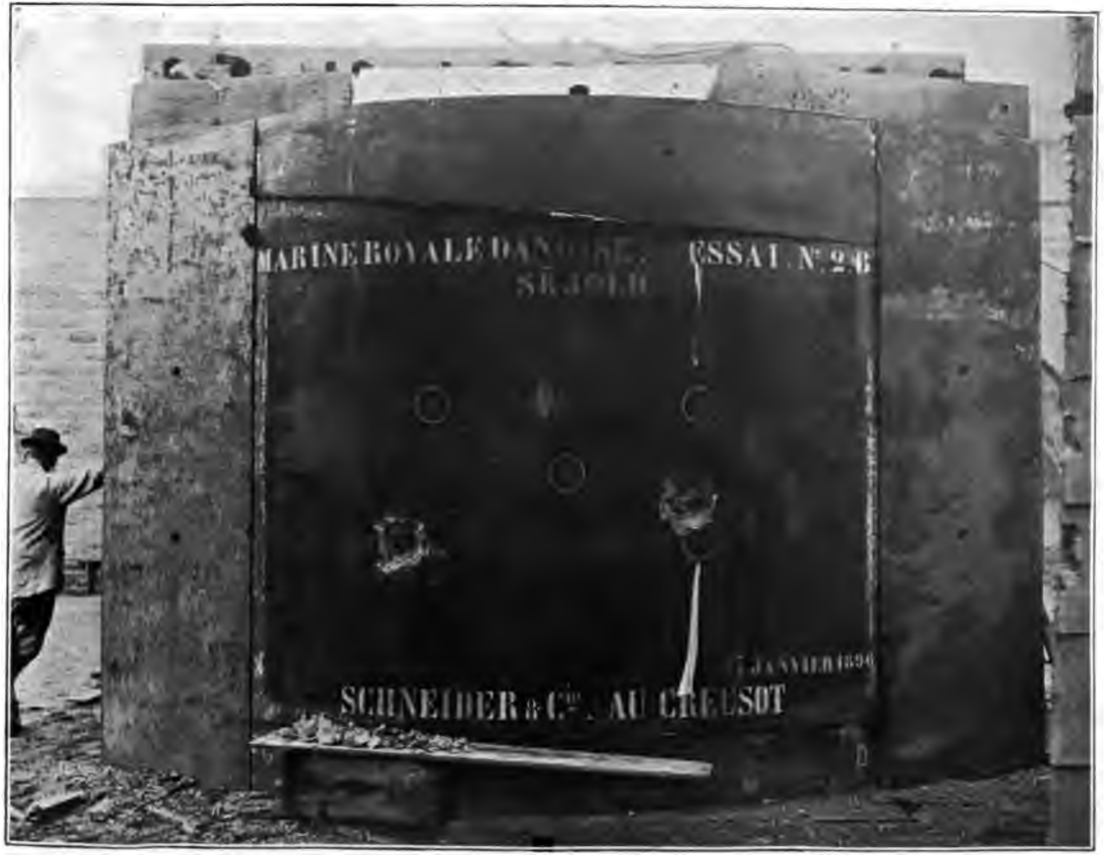
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Fig. 4.

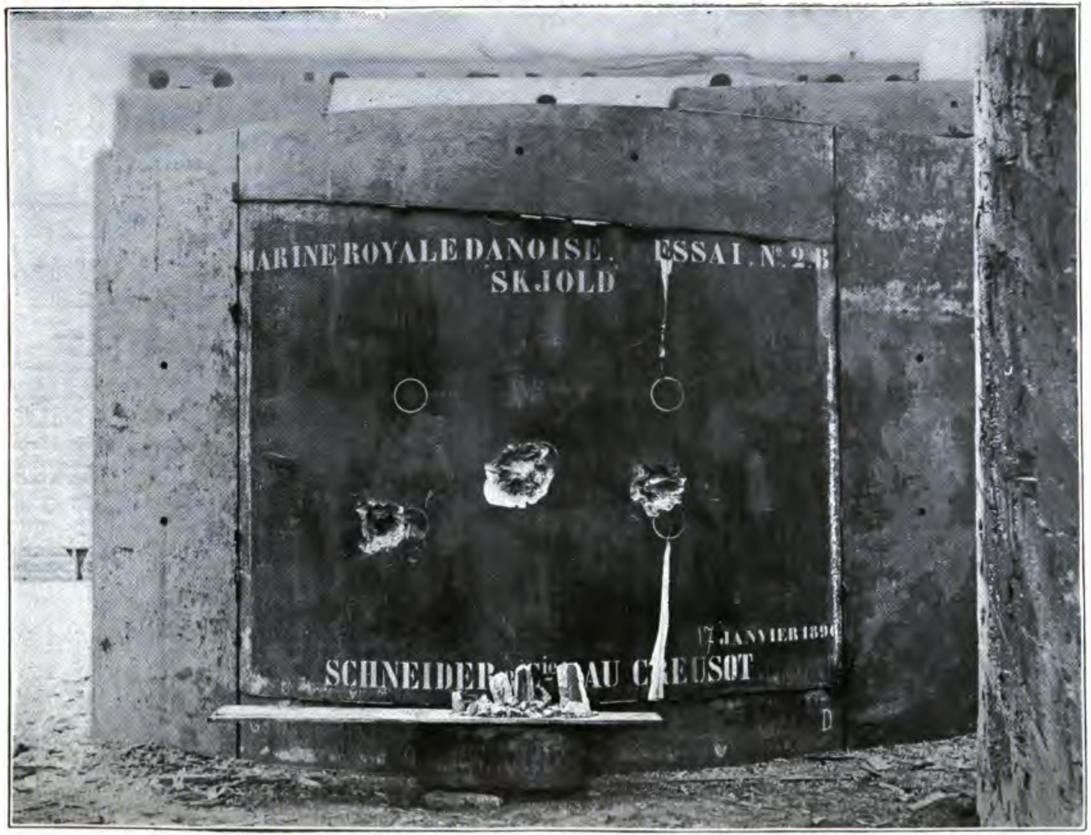
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Fig. 5.

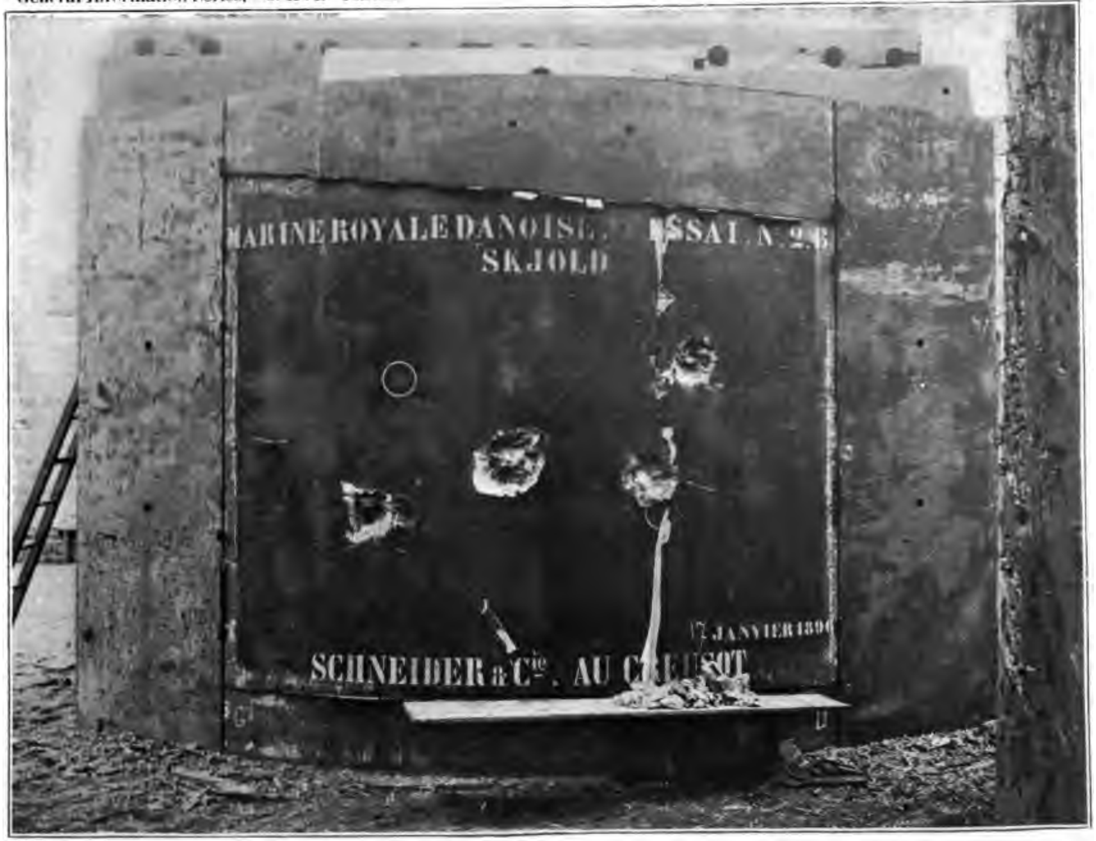
MARINE ROYALE DANOISE
SKJOLD
SSAI N 23
17 JANVIER 189
SCHNEIDER & Cie. AU CREUSOT

Fig. 6.

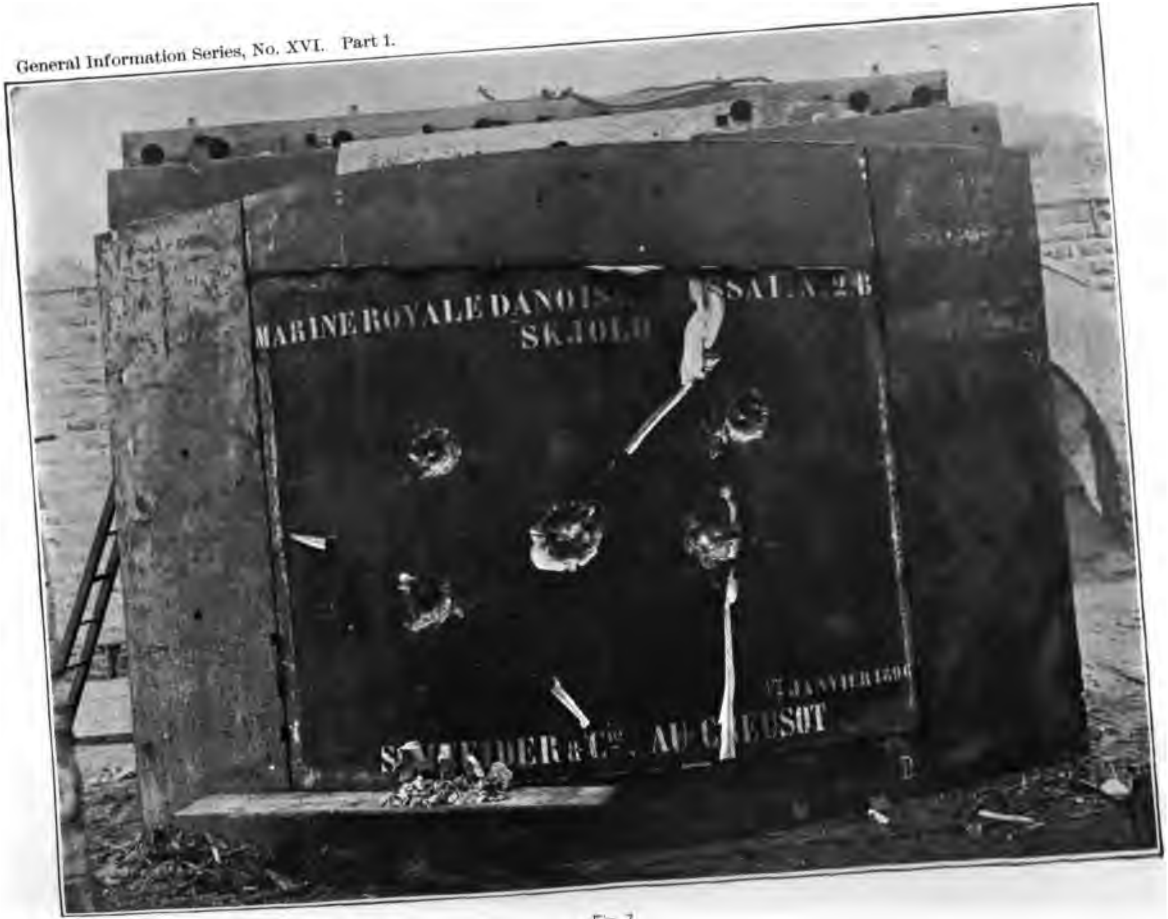
MARINE ROYALE DANOIS
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Fig. 7.

the carbon are about 1¼ inches in diameter, and are fused to a depth of about 1¼ inches, although the hard face extends only to a depth of one-half inch from the surface of the plate.

The time taken to fuse such a hole as described above with a current of 350 amperes, at 80 volts, is about forty-five seconds.

FRANCE.

CREUSOT FACE-HARDENED TURRET PLATES.

Firing trials of turret armor for the Royal Danish ship *Skiold* took place at Creusot on January 17, 1896. These plates are face-hardened nickel steel, and have these particulars: Length, 9 feet 6 inches; breadth, 7 feet 5 inches; thickness, 7.87 inches; weight, 10.65 tons. The gun used was a 5.91-inch Schneider & Co. of 45 calibers length. The projectiles were forged chrome steel Krupp of 112.4 pounds weight, and were furnished by the Royal Danish Government. Five shots were fired at the corners and center of a rectangle 3 feet, 3.4 inches by 2 feet, or spaced about 4 calibers (fig. 2). The plate was secured on the curved plate backing, representing the turret (fig. 1).

Shot No. 1.—Charge, 38.5 pounds; velocity, 2,053 foot-seconds (fig. 3).

Shot No. 2.—Charge, 38.5 pounds; velocity, 2,076 foot-seconds. An important vertical crack, apparently not very deep, was developed in the neighborhood of, and evidently originated by, the first shot (fig. 4).

Shot No. 3.—Charge, 37.4 pounds; velocity, 2,030 foot-seconds. Developed other slight surface cracks (fig. 5).

Shot No. 4.—Charge, 38.6 pounds; velocity, 2,070 foot-seconds. Increased the vertical crack developed by shots Nos. 1 and 2, and accentuated the surface cracks mentioned in No. 3 (fig. 6).

Shot No. 5.—Charge, 38.6 pounds; velocity, 2,076 foot-seconds. Increased the vertical crack and the flaking about it, and other finer cracks (fig. 7).

The projectiles in every case were stopped and smashed. The penetration can not have been great, for the backing, when stripped, showed no indentations. The projectiles did not seem to have been of high tenacious quality.

The plate is evidently of high quality, and was accepted without comment.

ITALY.

Recent trials have been made of Terni nickel-steel face-hardened armor plates. There were two plates (fig. 1), both of these dimensions: 7 feet 10.5 inchss by 5 feet 3 inches by 5.91 inches. The one to the right has four snakes in it, the one intending toward the center having a maximum depth of 0.3 inches and the others less plainly seen on the plates.

Shot No 1.—Fired at the left plate, 6-inch gun, Krupp steel projectile weighing 99.3 pounds; velocity on impact 1,968 foot-seconds. The projectile broke, fragments remaining embedded in the plate (fig. 2).

Shot No. 2.—Fired at the right plate, 6-inch gun, Krupp steel projectile, weighing 99.3 pounds; velocity on impact, 1,968 foot-seconds. The projectile broke, fragments remaining embedded in the plate (fig. 2).

Shot No. 3.—Fired at the right plate, 6-inch gun, Krupp steel projectile, weighing 99.3 pounds; velocity on impact, 2,034 foot-seconds. The projectile broke, fragments remaining embedded in the plate (fig. 3).

Shot No. 4.—Fired at the right plate, 6-inch gun, Krupp steel projectile, weighing 99.3 pounds; velocity on impact, 2,132 foot-seconds. The projectile passed entirely through the plate (fig. 3).

Shot No. 5.—Fired at left plate, 6-inch gun, Krupp steel projectile, weighing 99.3 pounds; velocity on impact, 1,213 foot-seconds. The projectile broke, fragments remaining embedded in plate. Penetration, about 2.4 inches (fig. 4).

Shot No. 6.—Fired at left plate, 6-inch gun, Krupp steel projectile, weighing 99.3 pounds; velocity on impact 1,443 foot-seconds. The projectile broke, fragments remaining embedded in plate. Penetration, about 2.8 inches (fig. 4).

○

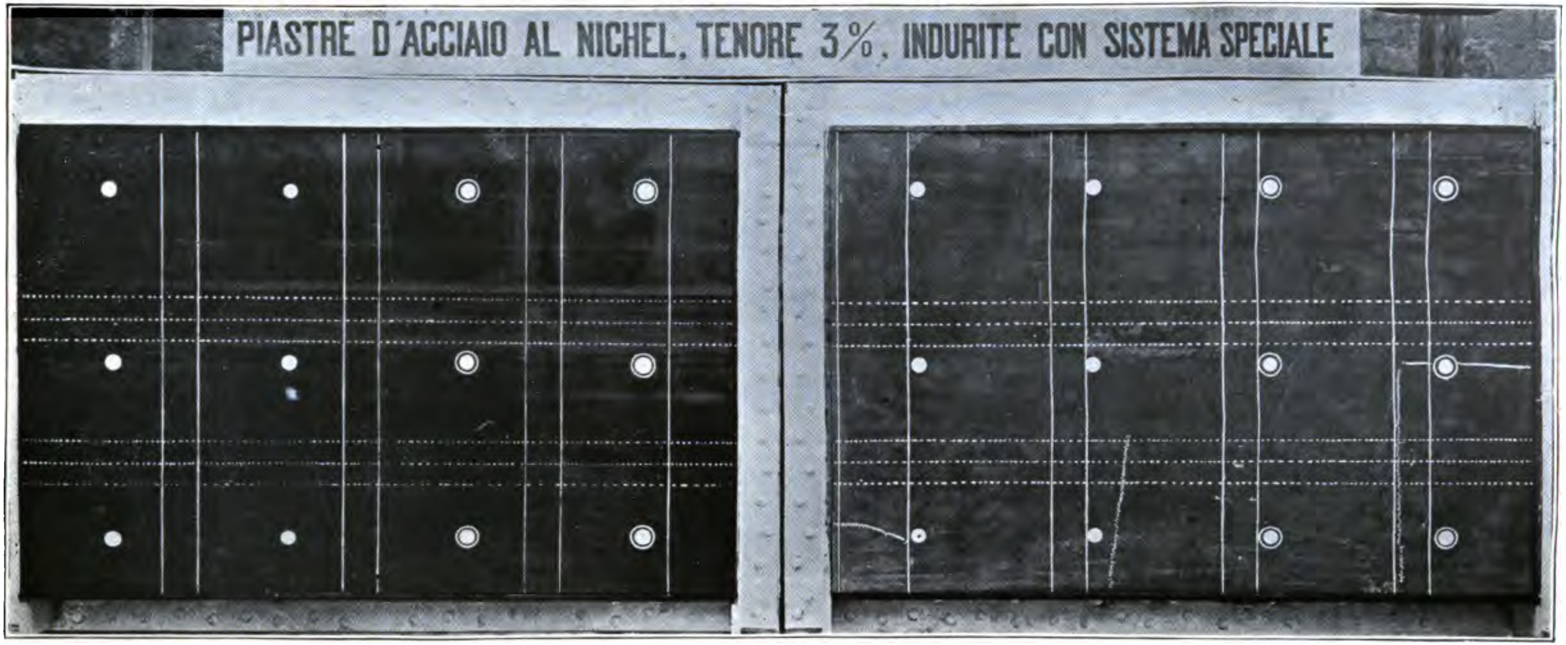
PIASTRE D'ACCIAIO AL NICHEL, TENORE 3%, INDURITE CON SISTEMA SPECIALE

Fig. 1.

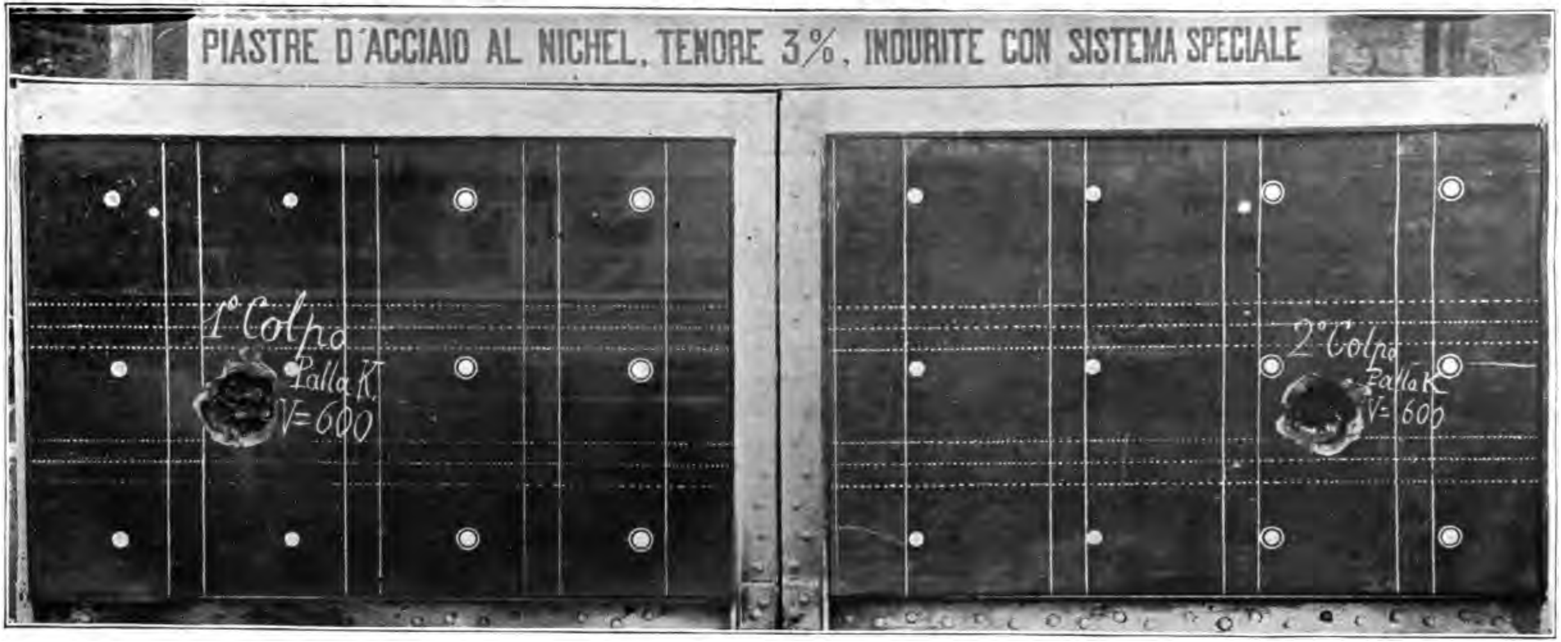
PIASTRE D'ACCIAIO AL NICHEL, TENORE 3%, INDURITE CON SISTEMA SPECIALE
1° Colpo
Palla K.
V=600
2° Colpo
Palla K.
V=600

Fig. 2.

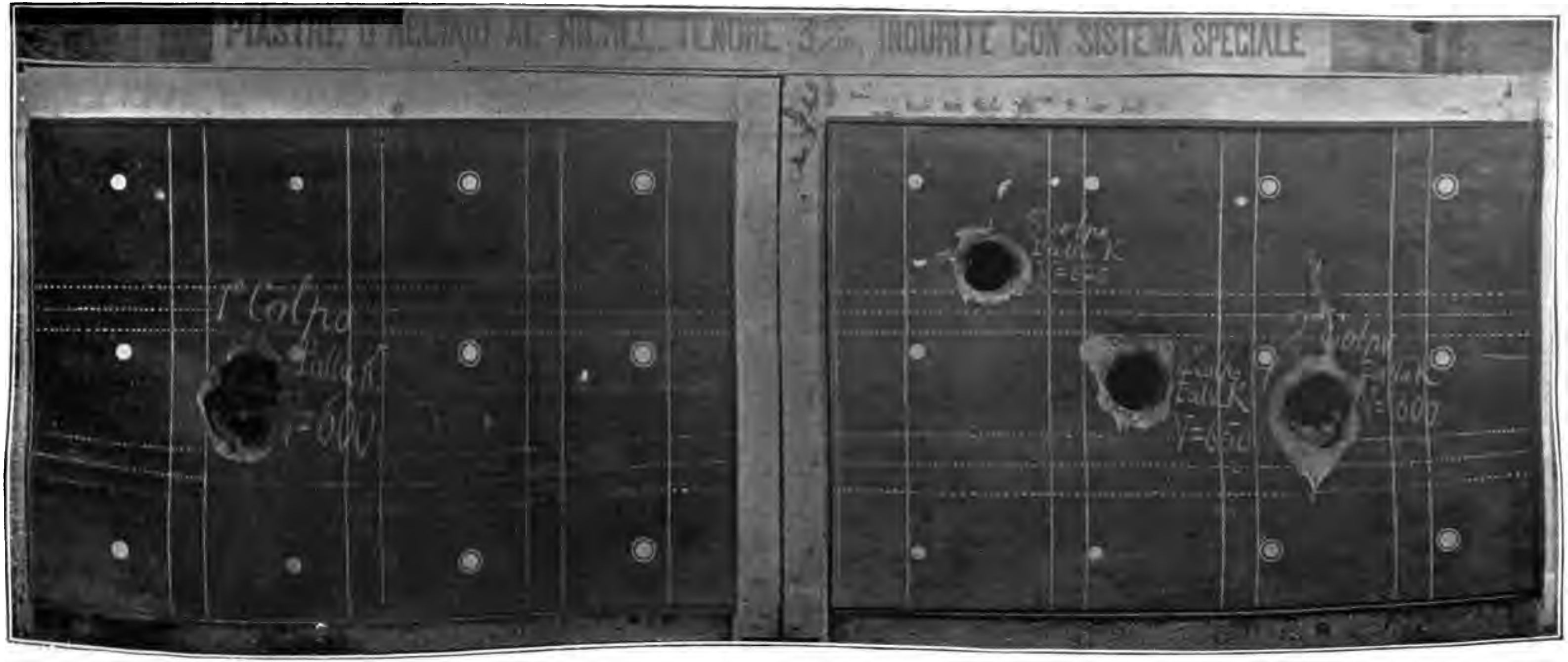
PIASTRE D'ACCIAIO AL NICHEL TENORE 3%, INDURITE CON SISTEMA SPECIALE
1° Colpo
Fall K
V=600
Fall K
V=650
Fall K
V=600

Fig. 3.

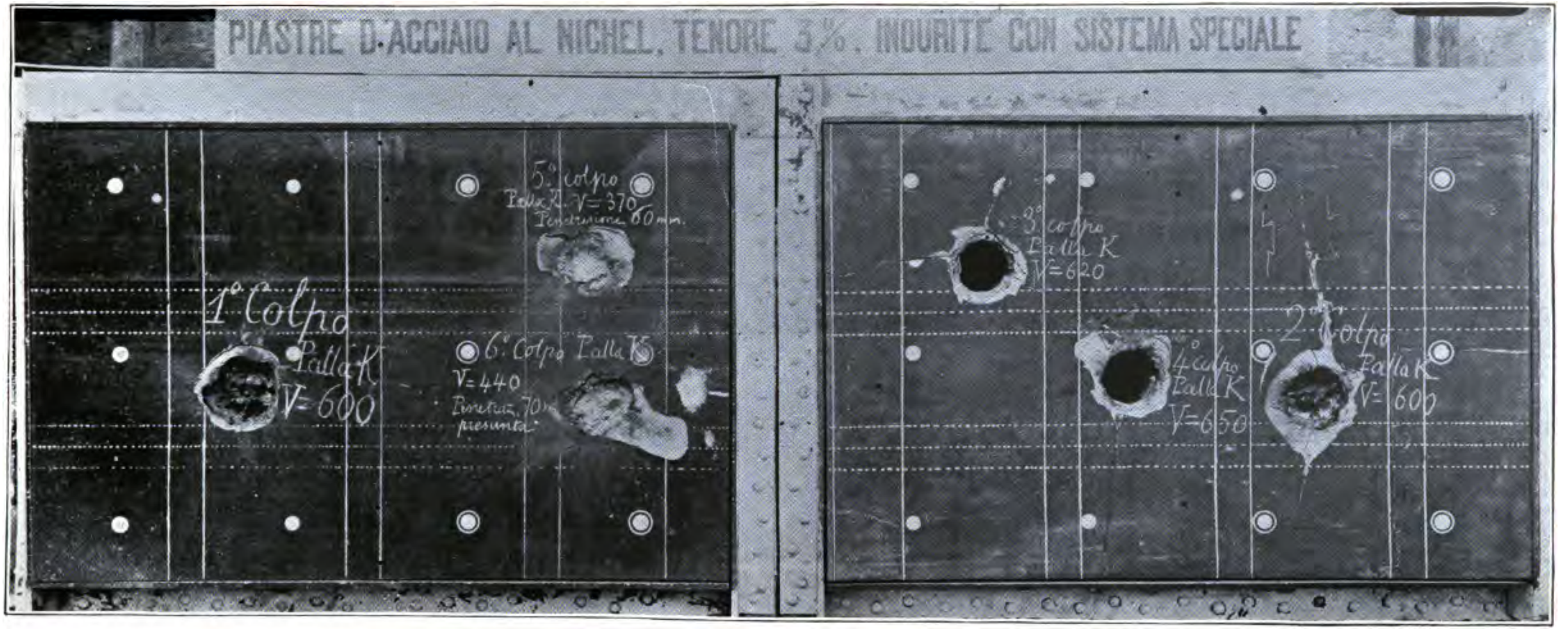
PIASTRE D'ACCIAIO AL NICHEL, TENORE 3%, INDURITE CON SISTEMA SPECIALE
1° Colpo Palla K V=600
5° colpo Palla K. V=370 Penetrazione 60 mm.
6° Colpo Palla K V=440 Penetraz. 70 m presunta
3° colpo Palla K V=620
4° colpo Palla K V=650
2° colpo Palla K V=600

Fig. 4.

OFFICE OF NAVAL INTELLIGENCE,
PART II: GENERAL INFORMATION SERIES, No. XVI.

INFORMATION FROM ABROAD.

NOTES

ON

NAVAL PROGRESS.

JANUARY, 1897.

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OFFICE OF NAVAL INTELLIGENCE.

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The Navy Dept.

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III.

NOTES ON SHIPS AND TORPEDO BOATS.

By Ensign W. K. HARRISON, United States Navy,
Staff Intelligence Officer.

ARGENTINA.

JOSÉ GARIBALDI, 6,840-TON ARMORED CRUISER.

(Page 61, No. XIII; 9, No. XIV; 13, No. XV.)

Battery.—The machine guns mentioned in No. XV are Maxim 11-millimeter (.433-inch) and are mounted in the upper fighting top, forward side; in the same top, after side, are mounted two of the 1-pounder R. F. G.; two 6-pounders are mounted in the lower top. In addition, the ship carries two 75-millimeter (2.955-inch) Krupp guns for land service. It is said that the 6-inch guns train only 130 degrees instead of 150 degrees. They are protected by low shields, without tops, 3½ inches thick, in addition to the armored side of the ship. Twenty-five shells for each 6-inch gun are kept at hand in racks. A peculiar revolving rack for holding projectiles is fitted in each turret. The rack is concentric with the turret and moves with it, but is also capable of independent motion, which is imparted by mechanism operated by hand. It is below the turret floor, and access is gained to it by raising a lid below and directly in rear of the breech of the gun. The rack is divided into sixteen compartments, each of which holds two shells, and as each compartment is emptied the rack is revolved to bring the next compartment under the opening. A crane, with drum and wire rope, is used for lifting the shell from the rack to the gun. When the rack is emptied the supply of shells is whipped up from the shell room by hand.

Main engines.—The main engines are side by side in separate water-tight compartments, and are triple expansion, vertical inverted, direct acting, designed to indicate 13,000 H. P. when making 116 revolutions; diameter of cylinders, 42½ inches, 63 inches, and 93 inches; stroke, 46 inches.

Boilers.—There are eight main and one auxiliary steel, cylindrical, single ended, horizontal fire, tubular boilers, the main boilers being arranged in two water-tight compartments with fore and aft fire rooms.

Forced draft is obtained by the closed ash-pit system, the air being supplied by eight blowers, four in each boiler compartment. Diameter of main boilers, 15 feet 2¼ inches; length, 10 feet 5 inches; grate surface per boiler, 96.8 square feet; heating surface, 2,690 square feet; steam pressure, 160 pounds.

Electric installation.—Four 4-pole compound dynamos, each being connected to a single-cylinder vertical engine with external governor in a fly wheel and having also a heavy fly wheel on the shaft between engine and dynamo. The output per dynamo is 300 ampères at 65 volts, with speed of 260 revolutions. The wiring of the ship is on six circuits, as follows:

I. Protected circuit, includes all lamps in the citadel and below the protective deck, numbering in all 450 12 C. P. lamps.

II. External circuit, includes lamps outside of the protected parts of the ship, used for general lighting, numbering in all 250 12 C. P. lamps.

III. Motors, including all on board.

IV. Search lights.

V. Dynamo room.

VI. Signals.

The total demand for electric current is as follows:

Circuit:		Ampères.
I.	450 lamps	315
II.	250 lamps	175
III.	3 ventilators forward, each 40 ampères	120
	3 ventilators aft, each 40 ampères	120
	3 motors in engineer's workshop	43
	2 motor transformers, each 7 ampères	14
	3 ammunition hoists, each 20 ampères	60
	2 large turret motors, each 90 ampères	180
	2 small turret motors, each 20 ampères	40
IV.	1 90-centimeter projector	90
	2 45-centimeter projectors, each 60 ampères	120
V and VI		70
Total		1,347

The switchboard is of black slate, about 12 by 6 feet, and is reported to be complicated and at the same time restricts the operation of the dynamos. It contains no provision for operating dynamos in parallel, and special pains have been taken to prevent it. It appears that there is but a small working margin in the dynamo installation, and that in action the demand for current might easily rise to the full output of the plant, so that an accident to one dynamo might cause serious embarrassment.

The use of electric motors is seen to be extensive. The ventilation of the ship, save in the fire rooms, is secured by six fans, each operated by a motor. In the engineer's workshop there are three machine tools, each run by a motor, and entirely independent of the others; three motors are employed for hoisting 6-pounder ammunition; two motor transformers are used to reduce to 4 volts for ordnance purposes, one being in each turret chamber; and the turrets are controlled by motors in addition to which there is hand-turning mechanism.

The turret-turning mechanism is described as follows:

There are two motors for each turret, one of 12 H. P., for rapid rotation, and the other of about 3, for slow movement as the sights come nearly on. Each motor is compound wound and is closed in a case for protection. Adjustable resistances are located in the turrets in a starting box at the hand of the officer in the sighting hood. Each motor has its own switch, and only one is to be worked at once. The switch of the large motor is fitted with springs, which keep it habitually open. If it is desired to turn the turret, the switch is moved in one direction and is held open as long as the rotation is to continue; on being released it breaks the circuit and stops the motor. Moving it the opposite way causes rotation of the turret in the other direction. Now, if slower motion is desirable, the switch of the smaller motor is moved either one way or the other over the contacts of the rheostat, which allows of varying the speed of the motors. There is nothing to prevent both motors being thrown in circuit at the same time by accident, which would cause injury. The small motor has one safeguard, a friction clutch on its line of gearing operated by an electro-magnet; if the resistance of the turret to motion should be excessive, this clutch is supposed to slip, allowing the armature to move and thus prevent its destruction by an excess of current.

Both motors are situated in the turret chamber and work the turret through reducing gear, the final wheel of which operates in a cogged circle on the base of the turret. The only device interposed to check or in any way regulate the scend of the turret in a seaway is the intervention of worm gearing in the reducing gear, and the efficiency and safety of this is questionable. To prevent injury to the motors, two stationary stops are so placed as to operate a switch and break the motor circuits before the turret reaches the position of extreme train in either direction. Each motor is compound wound, the shunt fields of both being in series and always excited when the motors are in use. Each motor has a single straight field magnet, the pole pieces at each end being curved around to inclose the armature. The latter is of the drum type, and uses carbon brushes.

The signal circuit is led directly to a distribution board in the pilot house, from which branches lead to the night signal apparatus, running lights, and to peak, position, top, stay, and truck lights, enabling each or all to be instantly controlled.

Electric range indicators are fitted, and range finders are to be, but it is not known of what type the latter will be.

VESSELS REFITTING.

The *Almirante Brown* is being prepared for her voyage to France to have her main battery of 7.87-inch guns replaced by ten 5.9-inch R. F. guns of 50 calibers. The new guns will be mounted, six in the redoubt and four on deck in the positions now occupied by the 4.7-inch R. F., which are moved, two to the bow and two to the stern, in place of the 7.87-inch guns, which they eliminate. The cost of the new guns and ammunitions will amount to $200,000 gold.

TORPEDO BOATS.

(Page 14, No. XIV; 7, Part I, No. XVI.)

The four first-class armored torpedo boats building by Yarrow & Co. at Poplar, have received the names *Santa Fé*, *Corrientes*, *Misiones*, and *Entre Rios*.

Corrientes was launched October 10, 1896, with engines and boilers on board. October 18 her official trials took place. Six runs were made over the Maplin measured mile, three with the tide and three against it, the data being as follows:

Direction of tide relative to boat.	Time on run.		Steam-pressure, boilers.	Mean revolutions.	Mean speed.
	Mins.	*Secs.*	*Pounds.*		*Knots.*
With	2	12	165	379	27.272
Against	2	9	160	376	27.906
With	2	10	157	375	27.692
Against	2	15	153	364	26.666
With	2	10	150	367	27.692
Against	2	15	155	372	26.666

Mean of mile runs: Revolutions, 372.1; speed, 27.359.

After the measured-mile runs, a 3-hour run was made, the average revolutions being 372.7, which by proportion with the data found by running on the measured mile gives a speed of 27.41 knots per hour. Total I. H. P. was 4,100. Coal used—best Welsh, not picked—total consumption on 3-hour run, 10 tons 1,300 pounds. Air pressure in fire rooms, 1.47 inches of water. Sea calm. No wind.

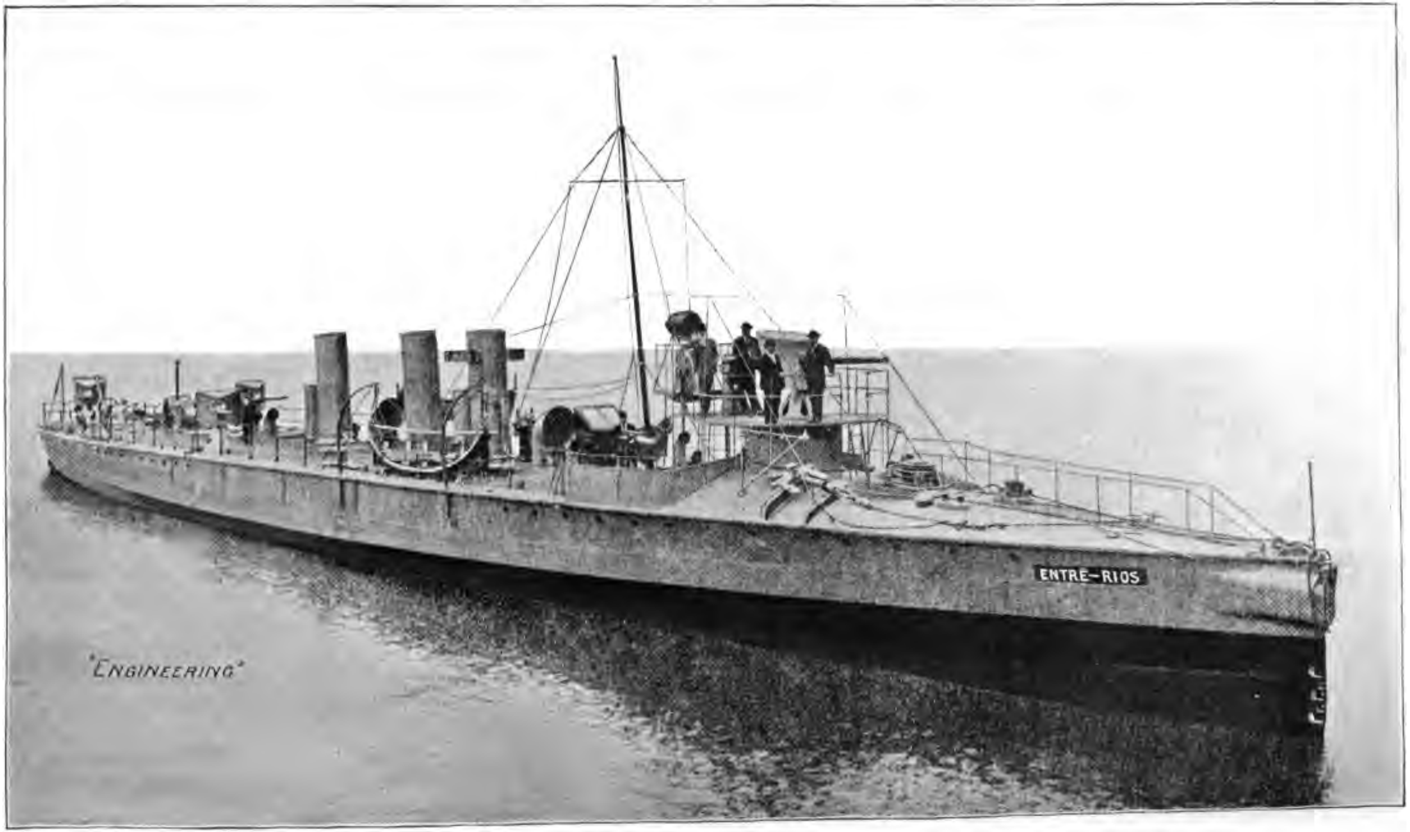
On this trial the boat carried a load of 35 tons, together with 56 persons. Her draught was 3 feet 11 inches forward, 4 feet 11 inches aft, displacement 205 tons. The following good features were noticed: Steadiness of ship and engines at every speed tried; the small turning circle at full speed, the diameter being under four lengths; the absence of squatting, and the dryness of the deck.

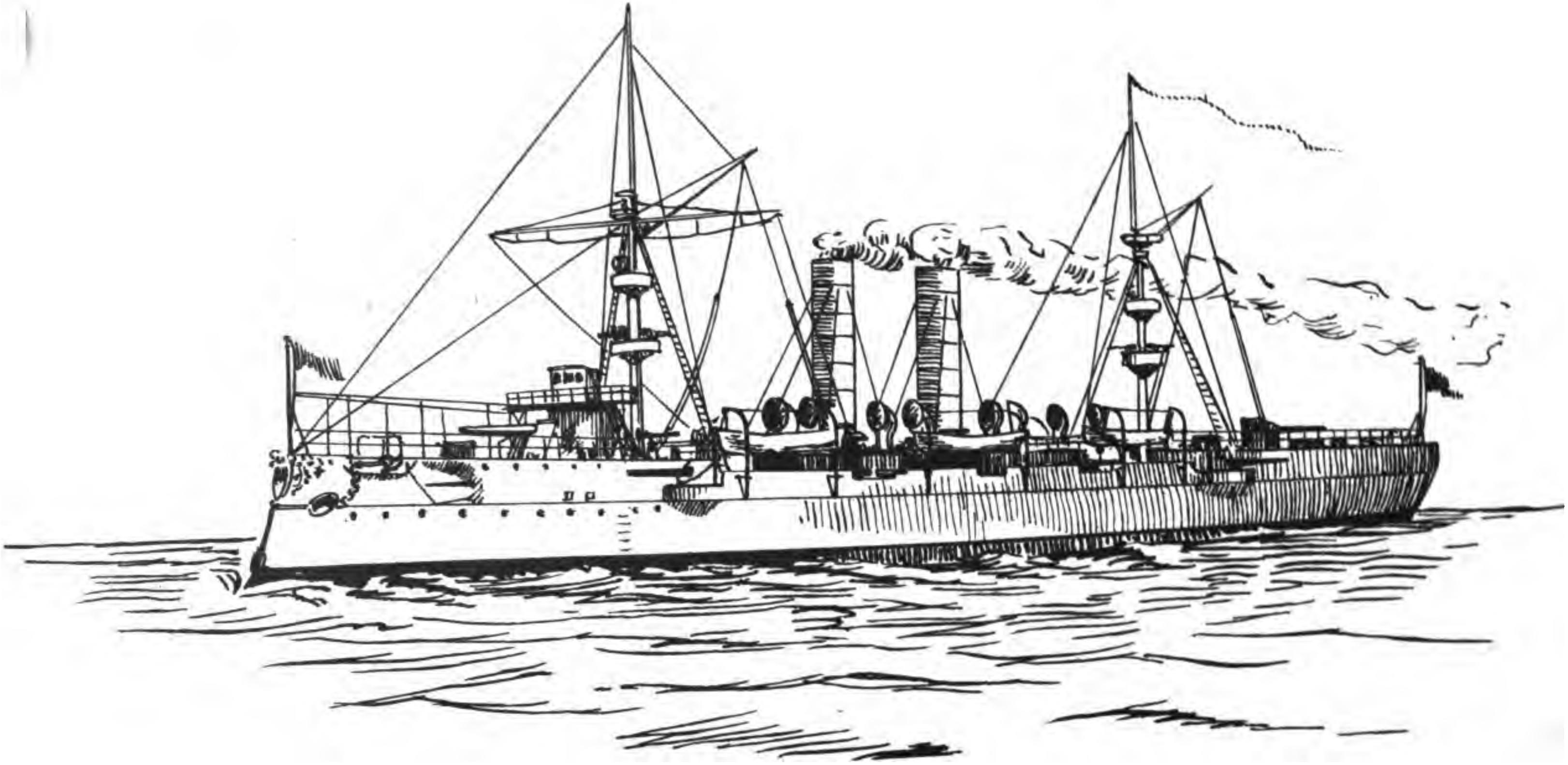
Entre Rios had her official trial September 1, 1896. These were of the same character as those of the *Corrientes*, and on the mile runs the following data were obtained:

Time on run.		Steam-pressure, boilers.	Mean revolutions.	Mean speed.
Mins.	*Secs.*	*Pounds.*		*Knots.*
2	18	148	368	26.087
2	9	150	370	27.907
2	18	150	369.5	26.087
2	10	146	364	27.693
2	23	145	358.5	25.175
2	10	145	361	27.693

Mean of mile runs: Revolutions, 365.2; speed, 26.774.

On the 3-hour run the revolutions averaged 364.8 per minute, giving a speed of 26.75 knots. The contract load of 35 tons was carried, and though the contract speed of 26 knots was exceeded by three-fourths of a knot, the boiler pressure was far below the designed working pressure of 220 pounds, so that it is evident had the boat been pushed she would have exceeded the obtained speed considerably. Consumption


ENTRE-RIOS
"ENGINEERING"



“ AMAZONAS.”

of coal on 3-hour run, 10½ tons. The *Entre Rios* has since made the voyage to Buenos Ayres, not calling at any port after leaving St. Vincent.

Misiones had her trial October 9. Contract load of 35 tons was carried. Average on mile runs: Revolutions, 366; speed, 27.128 knots. Average on 3-hour run: Revolutions, 365.2; speed, 27.06. Coal consumed on 3-hour run, 11¼ tons.

Santa Fé left Plymouth, England, for Argentina September 20, and on passage across the Bay of Biscay encountered a severe gale without accident. There can be no doubt of the seaworthiness of the class of large torpedo boats known as "destroyers"; it is only required that they be handled intelligently.

AUSTRIA.

STEAM TRIALS.

WIEN, 5,500-TON COAST-DEFENSE VESSEL.

(Page 16, No. XV.)

This vessel has had her steam trials. Obtained 17.6 knots, engines developing 8,500 H. P. It is reported that she is now ready for commissioning.

BRAZIL.

YPIRANGA. (Marshal Deodoro.)

(Page 14, No. XIV.)

One of the 3,112-ton coast-defense vessels has received this name.

ALMIRANTE BARROZO. (Reported sold to Japan.)

(Page 18, No. XV; 8, No. XVI, Part I.)

Dimensions.—Length, 330 feet 10 inches; beam, 43 feet 9 inches; mean draught, 16 feet 10 inches; displacement, 3,450 tons; speed, estimated, 20 knots.

Armament.—Six 50-caliber 6-inch R. F. guns,. disposed so as to fire three ahead and three astern; four 50-caliber 4.7-inch R. F. guns; ten 6 pounder and four 1-pounder Nordenfelt R. F. guns; four Maxim guns; two landing guns, and three torpedo tubes.

Protection.—A complete protective deck, in addition to which the coal bunkers extend to a height of 6 feet above the water line.

Coal.—850 tons maximum capacity, giving an estimated steaming radius of about 8,000 knots at most economical speed.

VESSELS LAUNCHED.

AMAZONAS.

Sister ship to the *Barrozo*, and the second of the three building at Elswick, was launched December 4.

TUPY.

(Page 18, No. XV.)

The second of the three 1,030-ton torpedo vessels building at the Germania Works, at Kiel, was launched during the middle of November.

CHILE.

GUN TRIALS.

ESMERALDA.

(Page 21, No. XV.)

This 7,000-ton armored cruiser had successful trials of her guns December 16. Among other tests, one 8-inch and four 6-inch guns were simultaneously fired in the line of the keel, guns being laid level, both ahead and astern.

TORPEDO BOATS.

CAPTAIN MUNIZ GAMERO.

(Page 23, No. XV.)

Had her steam trials October 15; average revolutions and speed for six runs over the measured mile were 369 and 30.42 knots, and for the 3-hour trial 365 and 30.0 knots.

Launched.—The first of the six first-class boats building by Yarrow & Co. (p. 23, No. XV) was launched December 3.

TENIENTE SERRANO.

The third of the four first-class torpedo boats of the "destroyer" type, building by Messrs. Ladd, of Birkenhead, has had her speed trials, with the result of 30.34 knots on the measured mile, and 30.35 knots for the 3-hour continuous run following.

CHINA.

It is reported that China proposes to make an earnest endeavor to reconstruct her navy and assume rank as a naval power. The Bay of Kiau Chiau, on the south side of the Shantung promontory, is to be dredged out, fortified, and made a great naval port, and the arsenal at Fuchau is to be reorganized and enlarged so as to be capable of constructing all types of war vessels.

VESSELS PROPOSED.

In addition to the three protected cruisers to be built at the Vulcan Works, Stettin (p. 23, No. XV), the Armstrong Company has received an order to build two protected cruisers, of which the following are the principal data.

Dimensions.—Length over all, 424 feet; between perpendiculars, 396 feet; extreme breadth, 46 feet 8 inches; mean draught, 16 feet 9 inches; displacement, 4,300 tons.

Armament.—Two 8-inch R. F., mounted on middle line forward and aft, and each having a train of 135 degrees on either side of the middle line; ten 4.7-inch R. F. guns mounted in broadside, but the two forward and the two after guns train from directly ahead or astern to 45 degrees abaft the beam, and the others have a train of 60 degrees on either side of the beam; sixteen 3-pounders; six 1-pounders, and five torpedo tubes. The 1-pounders are mounted one in each upper fighting top and two in each lower top. One torpedo tube is placed in the bow and two on each broadside.

Machinery and boilers.—Twin screws driven by triple-expansion vertical engines designed to develop 17,000 I. H. P.; four double-ended and four single-ended boilers.

Protection.—Protective deck generally 1.5 inches thick, but 3 inches thick on slopes over machinery and 5 inches thick over cylinders. Conning tower 6 inches thick.

These vessels are to have a steaming radius of 2,100 knots at full speed and 8,000 knots at 10 knots per hour. They are to make 24 knots speed on forced draft, 22.5 knots on natural draft, to cost $1,638,351 each, and to be finished in 18 months.

TORPEDO BOATS.

Four first-class torpedo boats of the following characterics have been ordered from the Schichau Co., at Elbing: Displacement, 200 tons; 32 knots speed; price, $947,406 for the lot; time of construction, thirteen months.

FRANCE.

Two budgets for 1897 have been presented to the National Assembly by the minister of marine, the second after the withdrawal of the first one. The report of the committee charged to examine this latter (the first budget) was given in the name of M. J. de Kerjegu, and is a very interesting document. The total sum asked for was 258,082,273 francs ($49,809,878.68), of which 79,796,231 francs ($15,400,672.58) was for new construction, which is smaller than the amount for any year that has been voted since 1892; but at the same time it is stated in the report that a powerful, well-organized navy has never been more necessary to France than now.

The belligerent in the wars of the future, as well as in the wars of the past, that has at its disposal a naval force sufficient to make it impossible for the enemy's ships to keep the sea, possesses a considerable factor of success in the general war. Historical examples are cited to prove the influence of superior navies on the results of various wars, the latest instance of which is the efforts of the Cuban insurgents to achieve the independence of the island from Spain, for, the report says, without a sufficient navy Spain might have to give up her efforts to maintain her dominion over the island. Furthermore, the nations surrounding France have been making unremitting efforts for twenty-five years to build up powerful navies at the cost of the heaviest sacrifices, and it is shown that while the other naval powers of Europe have been increasing year by year for several years their appropriations for new construction, France has been giving less.

A comparison is made between the fleets of the possible enemies in the Mediterranean and north seas and her own Mediterranean and northern fleets, which are shown to be so separated geographically as to be out of supporting distance of each other, at least during the earlier stages of a war, and in which comparison the French fleets do not show up very well. Following this are tables showing the total tonnage armored and unarmored, under construction by the principal European nations on October 1, 1896. These give the triple alliance 150,000 tons, while France scarcely had 130,000; Russia has 115,000 tons, but England 355,000, and then the report makes a statement of considerable importance as showing the view of the committee as to the proper naval policy of France. It is given as follows:

> These comparisons suffice to demonstrate that we have not the fleet our policy requires, that which would permit us to sustain with advantage a contest with the triple alliance, and also to facilitate the regulation of difficulties that might be engendered between England and ourselves by the prolonging of certain misunderstandings or the clashing of our interests, so often in contact all over the world.

The report admits that it is out of the question to think of creating fleets as powerful as those of England, yet it is contrary to the genius of the French people to make only a passive defense, so a means is sought for carrying on an active vital warfare, and a saying of the great privateer Duguay-Trouin more than a hundred and fifty years ago is quoted as being as true to-day as then:

> If we have war with England instead of rousing ourselves to fight battles on the sea, which are infinitely costly to France, and where the English will oftenest have the superiority of numbers, it would be more useful for the service of the King and more ruinous to our enemies if we had forty or fifty vessels of from seventy-four to fifty guns in the port of Brest, that could be sent out in squadrons, following the advice that we would have of their enterprises and convoys, to chase and overtake them.

It is further stated that the war against commerce, the sole possible against England, would be equally efficacious against Germany, whose merchant-marine tonnage is more than 1,300,000.

Following, the committee state their opinion as to the character of the ship-building program France ought to undertake, viz: To get as many units as possible, reducing the tonnage of the ships in order not to exaggerate the financial sacrifices of the nation. They must be fast ships, but with speeds that survive the trials and that can be counted upon in service, and they must be ships with large radii of action. In order to create this fleet as quickly as possible, a financial effort is necessary, but the importance of it would be considerably lessened if reforms be not made in the administration of the navy. It is stated that this administration, and particularly that of the arsenals, has not kept pace with the advancement in matériel, and the charge is made that at the central administration there is an absence of cohesion between the directions which do not try sufficiently to keep up the entente necessary for unity of action. Moreover, six grand commissions in their multiplicity paralyze the authority of the commandment, relax the execution of orders, and disperse the responsibility of the decisions.

As stated above, after the withdrawal of this estimate, the minister of marine presented another, which has not yet been published.

VESSELS PROPOSED, AUTHORIZED, OR BUILDING.

HENRY IV.

(Page 45, No. XIII; 18, No. XIV; 28, No. XV.)

After many vicissitudes, which will be understood by comparing the above references with the following description, this vessel appears to have settled down with these principal details, viz: Modified monitor in form; dimensions, length, 354.3 feet; breadth, 72.8 feet; draught aft, 23 feet; displacement 8,807 tons; three screws, triple-expansion engines, designed to developed 11,500 I. H. P., which will give an estimated speed of 17 knots; armament, two 10.8-inch B. L. R., seven 5.45-inch R. F. guns, twelve 47-millimeter R. F. guns, and two under-water torpedo tubes; normal coal supply, 713 tons, full capacity, 1,083 tons; giving, respectively, 5,000 knots at 10 knots per hour and 1,120 at full speed, and 7,586 knots at 10 knots per hour and 1,700 at full speed; complement, 26 officers and 438 men.

D'ESTREES (EX K.).

Third-class cruiser, sheathed, building at Rochefort. The order for her construction was given July 29, 1896, and 1900 is the year fixed for completion. The following are the principal details:

Displacement, 2,413 tons; dimensions, length, 311.6 feet, breadth, 39.4 feet, draught aft, 17.7 feet; twin screws, triple-expansion engines, designed to develop 8,500 H. P., which will give an estimated speed of 20.5 knots.

Armament.—Two 5.45-inch R. F. guns, four 3.94-inch R. F. guns, and eight 3-pounders.

Normal coal supply, 340 tons; full capacity, 472 tons, giving radii of action, respectively, 5,750 knots at 10 knots per hour and 930 at full speed, and 8,000 knots at 10 knots per hour and 1,290 at full speed. Complement, 15 officers and 219 men. Estimated cost $910,711.

VESSELS LAUNCHED.

GAULOIS.

(Page 45, No. XIII; 29, No. XV.)

This 11,260-ton battleship, sister to the *Charlemagne* and *St. Louis*, was launched at Brest, October 6, exactly nine months after she was laid down. In this case an effort was made to establish a record. She was laid down on the same ways as the *Charlemagne*, the same plans and tracings were used, and considerable material was gathered in advance of the laying down. The *Charlemagne* was on the ways sixteen and a half months.

CATINAT.

(Page 47, No. XIII.)

This cruiser, a modified *Descartes* (p. 22, No. XIV), was launched from the yard of the Forges et Chantiers de la Méditerranée, at Havre, October 8. The principal details are as follows: Length, 332 feet; beam, 44.3 feet; draught aft, 21.2 feet; displacement, 4,000 tons; twin screws; triple-expansion vertical engines, designed to develop 9,000 I. H. P., giving a speed of 19 knots; steam furnished by Belleville boilers; complete protective deck, supplemented by cofferdams; four 6.46-inch R. F. guns, protected by 2.13-inch shields; ten 3.94-inch R. F. guns, with shields of same thicknes; ten 47-millimeter, four 37-millimeter, and two torpedo tubes. The ship is sheathed with one thickness of planking, and has a bunker capacity of 559 tons, giving an estimated radius of action of 6,000 knots at 10 knots speed, and 1,000 at maximum speed.

STEAM TRIALS.

CHARLES MARTEL, 11,900-TON BATTLESHIP.

(Page 9, Part I, No. XVI.)

Had a 6-hour coal-consumption trial September 30 at 5,000 I. H. P., and it was considered to be very satisfactory. Coal consumed was $3\frac{750}{2240}$ tons per hour; H. P., 5,382; speed, 13,806 knots. The secondary battery of this vessel has been changed to some extent, and now consists of five 37-millimeter R. F. guns, fourteen 47-millimeter, and four 65-millimeter (9-pounders).

PASCAL, 3,988-TON CRUISER.

(Page 32, No. XV.)

This ship has had a 3-hour speed trial. Engines developed 7,232 I. H. P.; mean speed, 18.5 knots, coal consumption being 1.8 pounds per I. H. P. per hour.

VESSELS UNDERGOING MODIFICATIONS.

JEAN BART.

Military masts are to be replaced by simple schooner-rigged masts. The small guns formerly mounted in the fighting tops will now be placed on the bridges and spar deck.

FORMIDABLE.

In addition to receiving new boilers, her middle 14.6-inch gun is to be replaced by four 6.3-inch R. F. guns.

GUN TRIALS.

DRAGONNE.

(Page 117, No. IV.)

Experiments with mortar fire by this vessel have recently been made. The idea is not a new one in France, for there was laid down during the ministry of Admiral Aube, in 1886, a boat (the *Gabriel Charmes*) designed for the especial purpose. She was of 74 tons displacement and similar to a torpedo boat, but instead of a torpedo tube there was mounted a 5.5 B. L. R. about 26 feet from the bow, the boat being especially strengthened to withstand the shock of recoil. However, the experiments were not considered satisfactory and she was transformed into a regular torpedo boat. The *Dragonne* is of 320 tons displacement. A 6.1-inch mortar on coast carriage was mounted on board, and two series of firings have taken place. The first consisted of ten shots, five underway and five at rest, against an elevated shore battery at 5,200 meters (5,687 yards). All the shots struck within a square of 400 meters (437 yards) side; some swell was on at the time, the vessel making rolls of 10° on each side. The second series consisted of five shots underway and five at rest at each of the following ranges at an old hulk, the *Panama*, which had been filled with casks to prevent her from sinking (1,500 meters (1,674 yards), 1,000 meters (1,094 yards):

	Range.	Shots fired.	Hits.
	Meters.		
Anchored	1,500	5	1
Underway		5	1
Anchored	1,000	5	2
Underway		5	3
Anchored	500	5	4
Underway		5	3
Anchored	300	5	4
Underway		3	3
Total		38	21

The *Panama* filled and sank in spite of the casks. The firing began at 5 p. m., and most of it was done in a bad light and at the same time the vessel was rolling 20 degrees. This firing was considered so satisfactory that the experiments are to be continued, and it is reported shells carrying 17 kilos (37.4 pounds) of melenite are to be used.

TORPEDO BOATS BUILDING, ORDERED, OR PROPOSED.

DURANDAL AND HALLEBARDE.

First-class torpedo boats of the "destroyer" type, and the first of this type to be designed for the French navy, are to be built at the Normand yard. They have the following principal characteristics: Displacement, 300 tons; dimensions, length, 180.4 feet; breadth, 19.5 feet, draught of water aft, 10.5 feet; triple-expansion engines designed to indicate 4,800 H.P.; twin screws; Normand boilers; estimated speed, 26 knots; armament, one 65-millimeter (9-pounder) R. F. gun, six 47-millimeter R. F. guns, and two torpedo tubes. They will carry 44 tons of coal in bunkers, giving estimated radii of action of 2,500 knots at 10 knots speed, and 1,000 at maximum speed. Complements of 4 officers and 44 men. These boats are to cost $325,397 each.

CYCLONE (EX TENARE).

Seagoing torpedo boat, also building at the Normand yard, having the following characteristics: Displacement, 149.4 tons; dimensions, length, 147.6 feet; breadth, 15.2 feet; draught aft, 4.9 feet; twin screws, triple-expansion engines, Normand boilers, 3,300 I. H. P., giving estimated speed of 30 knots; armament, two 47-millimeter R. F. guns and two torpedo tubes; bunker capacity, 17 tons, giving estimated radii of action of 1,800 miles, at 10 knots, and 200 knots at maximum speed; cost, $180,358; complement, 2 officers and 32 men.

NOS. 201 AND 211.

Second-class boats of exactly similar characteristics, viz: Displacement, 82.7 tons; dimensions, length, 37 millimeters (121.3 feet); breadth, 13.3 feet; draught aft, 8.5 feet; single screws, triple-expansion engines, Normand boilers, 1,500 I. H. P.; estimated speed, 23.5 knots; armament, two 37-millimeter R. F. guns and two torpedo tubes; bunker capacity, 10.5 tons, giving estimated radii of action of 1,800 knots at 10 knots speed and 200 at maximum speed; complement, 2 officers and 21 men; cost, *No. 201*, $86,842; *Nos. 202* to *205*, $88,007; *Nos. 206* to *211*, $74,983. *Nos. 201* to *205* are building at the Normand yard, and *Nos. 206* to *211* at the yard of the Société de la Gironde at Bordeaux. A noteworthy fact in regard to all of the torpedo boats above described is that they are of the Normand type and have Normand boilers.

STEAM TRIALS.

MANGINI.

This first-class boat had forced-draft trials at Lorient during October and obtained a speed of 27 knots, being 2 knots in excess of estimated speed. This boat has the following principal characteristics: Displacement, 127 tons; dimensions, length 147.6 feet, breadth 14.75 feet; draught aft, 6.9 feet; twin screws; triple-expansion engines of 2,100 I. H. P.; Du Temple boilers; armament, two 47-millimeter R. F. guns and two torpedo tubes; bunker capacity, 18 tons, giving estimated radius of action of 1,800 knots at 10 knots speed and 200 at maximum speed.

CASUALTIES.

Torpedo boats *Nos. 61* and *83*, while exercising off Brest November 19, came into collision, both going at about 12 knots speed. The bow of *No. 61* struck *No. 83* on the starboard side abreast of the boilers, and the latter sank in just three minutes, one man being drowned and three injured. *No. 83* is one of a type of fifty (*Nos. 75* to *125*), 35 meters (114.8′), designed in 1885, that has been very unfortunate. March 21, 1889, *No. 110* foundered with all hands in a heavy sea while making passage from Brest to Cherbourg, and March 1, same year, *No. 102* capsized off Toulon with considerable loss of life while in company with five other boats. After these accidents the class underwent modifications, so that there is not much fear of their stability, but they seem to lack in strength of hull. On the contrary, *No. 61* is one of a type of 33-meter (108.2′) boats built about 1880 by Normand. Boats of this type have done good service and are still considered to be good and reliable boats.

GERMANY.

By reason of the success of some recent trials, an order has been issued that in new construction designed to carry guns of these sizes the 24-centimeter (9.45 inches), 21-centimeter (8.27 inches), 15-centimeter (5.9 inches) Krupp R. F. L/40 shall be installed. It is claimed that these guns mark a great advance in naval ordnance, and their installation on board of German ships gives the latter considerable superiority over similar foreign vessels. This order will affect the following ships under construction: *Kaiser Friedrich III* (p. 41, No. XV), *Ersatz Friedrich der Grosse*, sister to above, *Ersatz Leipzig*, cruisers *K. L. Ersatz Freya*, and *M.* and *N.* (p. 42, No. XV).

VESSELS BUILDING, ORDERED, OR PROPOSED.

The navy department has asked for appropriations for the following new vessels: *Ersatz König Wilhelm* (to be of same type as *Kaiser Friedrich III*). Second-class cruisers *O* and *P*, *Ersatz Falke*, *Ersatz Hyane*, *Ersatz Iltis*, one torpedo division boat and eight torpedo boats, but as yet the Reichstag has not voted them. Appropriation was also asked for new machinery, new boilers, and thorough overhaul of the four second-class battleships of the *Sachsen* class. The changes on the *Baden* and the *Bayern* of this class are nearly completed.

VESSELS STRUCK FROM LIST.

The battleships *Preussen* and *Friedrich der Grosse* have been stricken from the list of seagoing vessels and relegated to duty as harbor ships.

GREAT BRITAIN.

VESSELS AUTHORIZED OR BUILDING.

FOUR FIRST-CLASS CRUISERS.

(Page 51, No. XV.)

These have received the names *Argonaut*, to be built by J. & G. Thomson, Clydebank; *Ariadne*, by the Fairfield Company, Glasgow; *Amphitrite*, by the Naval Construction and Armaments Company, Barrow-in-Furness, and *Spartiate*, to be built at Pembroke dockyard. These vessels are in general similar to the four of the *Diadem* class (p. 35, No. XIV), but there are slight differences in the details. Their principal characteristics are: Length between perpendiculars, 435 feet; breadth, 69 feet; mean draught, 25.25 feet; displacement on this draught, 11,000 tons; twin screws; four cylinder triple-expansion engines, designed to develop 18,000 H. P. when working at 120 revolutions, and giving an estimated speed of 20.75 knots; 30 Belleville boilers with total heating surface of 47,850 square feet, and grate surface, 1,390 square feet, making steam at working pressure of 300 pounds per square inch; complete protective deck having a rise of 10 feet, and varying in thickness from 4 inches on slopes to 2.5 on crown; coal bunks above and below protective deck; armament—sixteen 6-inch R. F. guns, twelve 12-pounders, three 3-pounders, eight Maxims, and three torpedo tubes, of which two are below water and one above, located at the stern. These vessels are to be sheathed with teak.

IMPROVED TALBOTS.

(Page 51, No. XV.)

The three cruisers of this type have received the names *Hyacinth*, *Highflyer*, and *Hermes*, and are to be built, the first two by the Fairfield Company, Glasgow, and the last by the London and Glasgow Shipbuilding Company. They are similar to the *Talbot*, but larger, and are designed to carry more coal, be somewhat faster, and have a heavier armament. They are to be 360 feet long, 54 feet breadth, 6,000 tons displacement, to be fitted with Belleville boilers of 10,000 H. P., and to make about 20 knots.

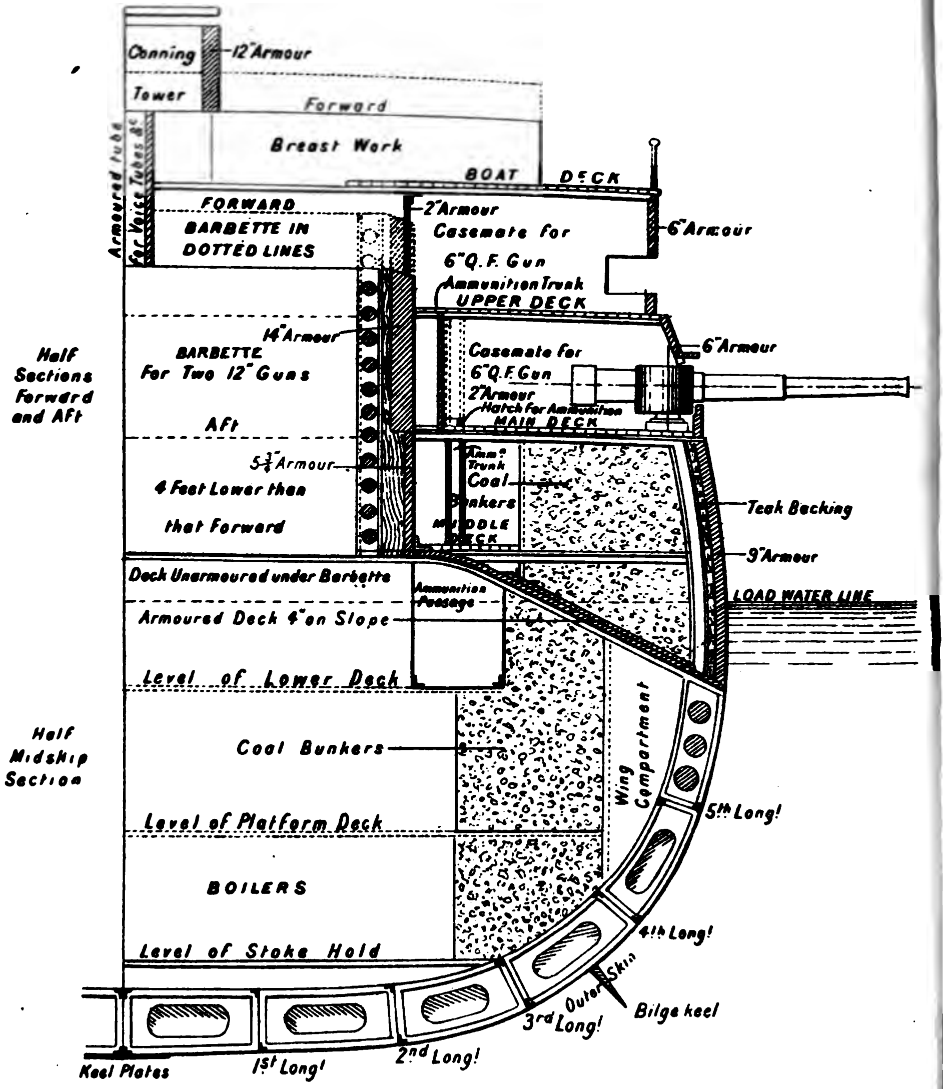
GLORY.

(Page 9, Part I, No. XVI.)

The keel of this first-class battleship was laid December 1, 1896.

VESSELS LAUNCHED.

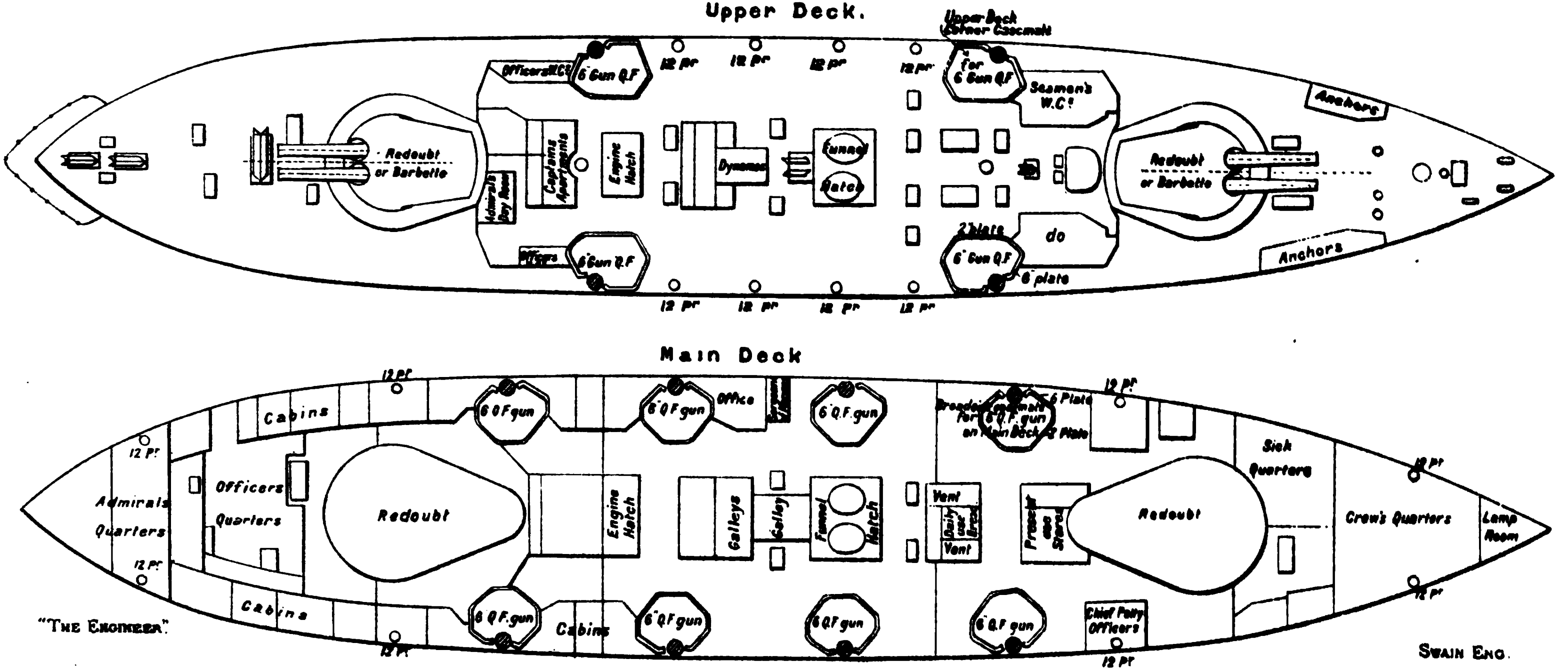
Diadem, first-class cruiser (British classification), 11,000 tons (p. 35, No. XIV), October 20. *Furious*, second-class cruiser (British classification), 5,750 tons (p. 35, No. XIV), December 3. *Gladiator*, second-



COMBINED SECTION

"THE ENGINEER"

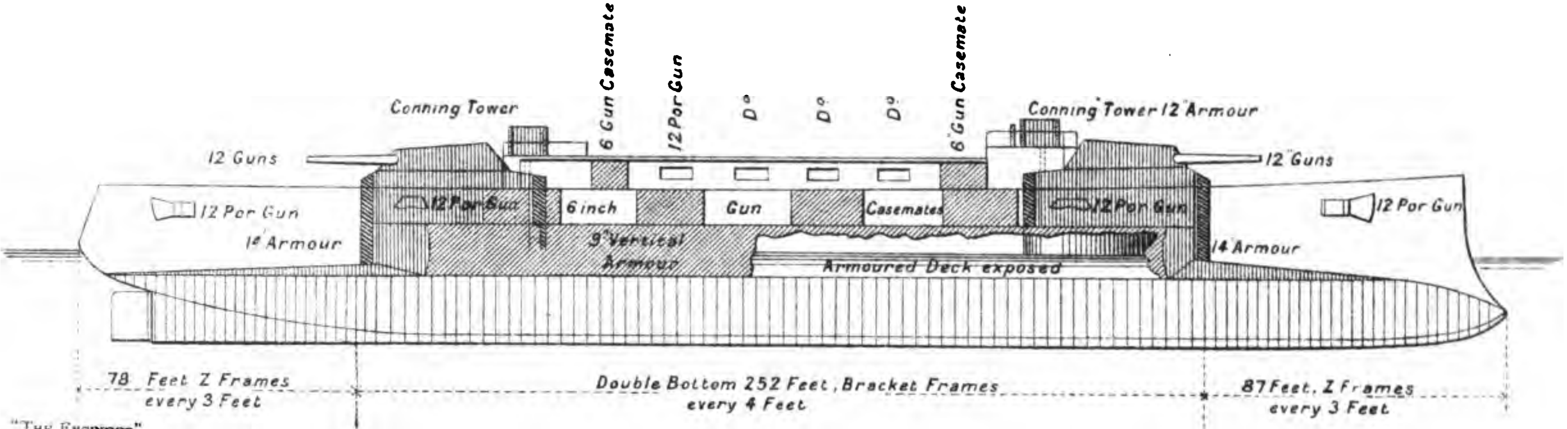
H.M.S. PRINCE GEORGE.



"The Engineer."

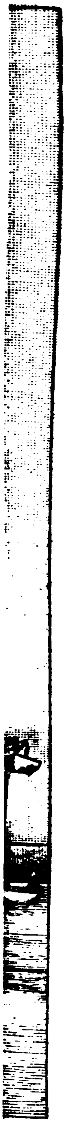
Swain Eng.

H.M.S. PRINCE GEORGE



"The Engineer."

H.M.S. PRINCE GEORGE—DISPOSITION OF ARMOUR



class cruiser (British classification), 5,750 tons (p. 35, No. XIV), December 8. *Proserpine*, third-class, cruiser (British classification), 2,135 tons (p. 36, No. XIV; 53, No. XV), December 5.

STEAM TRIALS.

AMPHION.

After extensive refit has undergone a 4-hour trial, during which the engines developed 5,105 I. H. P., and a speed of about 16 knots was obtained. Three previous trials proved unsuccessful.

DIANA, DORIS, JUNO, MINERVA, AND VENUS, 5,600-TON PROTECTED CRUISERS.

(Page 52, No. XV.)

Name.	Trial.	I. H. P.	Speed.	Consumption.
			Knots.	*Pounds.*
Diana	Forced draft, 4 hours	9,875	20.6	
	Natural draft, 8 hours	8,252	19.72	*a* 2.25
	Coal consumption, 30 hours	4,916	17.24	1.47
Doris	Forced draft, 4 hours	9,851	20.1	
	Natural draft, 8 hours	8,392	19.1	
	Coal consumption, 30 hours			
Juno	Forced draft, 4 hours	9,771	20.75	
	Natural draft, 8 hours	8,273	18.9	
	Coal consumption, 30 hours	4,863	16.3	1.64
Minerva	Forced draft, 4 hours	9,891	20.34	
	Natural draft, 8 hours	8,221	19.6	
	Coal consumption, 30 hours	4,919	17.52	1.7
Venus	Forced draft, 4 hours	9,774	20.18	
	Natural draft, 8 hours	8,204	19.25	
	Coal consumption, 30 hours	4,876	16.8	1.6

a Per I. H. P.

MAJESTIC.

(Page 53, No. XV.)

This first-class battleship has recently undergone a progressive series of trials to determine if the speeds given on the official steam trials are illusory or not. The first series consisted of five runs over the measured-mile course in Stokes Bay, with following results:

Run.	Mean revolutions.	Total I. H. P.	Speed.
			Knots.
First	24.51	223.04	4.103
Second	60.40	2,224.27	10.357
Third	74.62	4,116.20	12.547
Fourth	85.80	7,010.48	14.305
Fifth (full natural draft)	98.18	10,082.90	16.096

Second series consisted of runs under forced draft over a 23-mile course, giving results as follows:

Run.	Air pressure.	Mean revolutions.	Total I. H. P.	Speed.
	Inches.			*Knots.*
First	1	103.10	11,814	16.86
Second	1.08	102.45	11,914	16.90
Third	1.17	103.40	11,673	16.80
Mean	1.08	102.98	11,800	16.85

These results are considered to be satisfactory, since on her natural-draft trials September, 1895, she made but 16.9 knots by patent log, with engines developing 10,418 I. H. P., and on forced draft the speed was then 17.9 and I. H. P. 12,497.

PELORUS, 2,135-TON CRUISER.

(Page 53, No. XV.)

This vessel had her trials during the first week of November, of which the following are the principal data:

Trial.	Pressure in boilers.	Mean revolutions.	Mean total I. H. P.	Speed. [a]
	Pounds.			*Knots.*
Forced draft, 4 hours	260	217	7,028	20.73
Natural draft, 8 hours	250	189	5,249	19
Coal consumption, 30 hours	248	162	3,567	16.25

[a] Patent log.

POWERFUL.

(Pages 15, No. XIII; 39, No. XIV.)

This vessel has recently undergone a series of exhaustive and severe steaming trials, principally for the purpose of determining the efficiency of her installation of Belleville water-tube boilers, of which she has 48. These trials are very interesting from a professional point of view, not only because this is the first large vessel of the British navy fitted with water-tube boilers that has been tried, but because of the character of the ship herself and the purpose for which she was designed. As has been stated, her boiler installation consists of 48 Belleville boilers. These are designed for a working pressure of 260 pounds per square inch, have a total heating surface of 69,453 square feet, and a total grate area of 2,192 square feet. They take up 186 feet of the length of the vessel, which is divided into eight water-tight compartments by one longitudinal and five thwartship bulkheads. The boilers are arranged to be fired fore and aft.

The program of trials consisted of a run of thirty hours at 5,000 I. H. P.; one of thirty hours at 18,000 I. H. P.; last, a run of eight hours, of which the first half was at 25,000 I. H. P. and the second half at 22,000 I. H. P. The first two runs were for the purpose of determining the coal consumption at the powers developed. A start for the first trial was made on September 25, but after running ten hours it was decided to return to Spithead on account of a severe storm which had sprung up. Although this was a failure as far as desired results were concerned, yet it proved the seaworthiness and steadiness of the ship in a seaway. September 28 the 5,000-H. P. trial commenced, and terminated on the 29th successfully. The 18,000-H. P. trial was made on the 13th and 14th of October, and on November 27 the final trial took place. The following table gives the principal data of these trials:

Trial.	Draught.		Boiler pressure.	Vacuum.		Revolutions.		
	For-ward.	Aft.		Star-board.	Port.	Star-board.	Port.	Mean.
	Ft. In.	*Ft. In.*	*Pounds.*	*Inches.*	*Inches.*			
5,000 I. H. P. (30 hours)	27 3	27 2	225	26.8	27	67.4	67	67.2
18,000 I. H. P. (30 hours)	27 5	27 6	232	26.7	26.5	103.62	101.98	102.8
25,000 I. H. P. (4 hours)	26 3	28 1	257	26.2	25.9	115	113.8	114.4
22,000 I. H. P. (4 hours)	26 3	28 1	237.5	26.2	26	109.6	109.5	109.55

Trial.	I. H. P.			Mean speed.	Coal per I. H. P. per hour.
	Star-board.	Port.	Total.		
				Knots.	*Pounds.*
5,000 I. H. P. (30 hours)	2,455	2,553	5,008	14	2.07
18,000 I. H. P. (30 hours)	9,188	9,245	18,433	20.8	1.838
25,000 I. H. P. (4 hours)	12,665	13,231	25,886	21.8	(*a*)
22,000 I. H. P. (4 hours)	10,955	11,679	22,634	(*a*)	(*a*)

(*a*) Not taken.

Although the speed fell short of the estimated 22 knots, these trials are considered to be an unqualified success as far as the boilers are concerned and completely vindicate the admiralty in their determination to make such a radical change in the character of the boilers installed in the large ships. In the interval between the 18,000-H. P. and the 25,000-H. P. trials, the smoke pipes had been lengthened 10 feet, and the change proved advantageous. It is interesting to note that during all of these trials the maximum temperature recorded in the engine rooms was 75 degrees, and in the fire rooms the temperature never exceeded 90 degrees. The importance of these figures is obvious.

VESSELS REFITTING.

AUDACIOUS.

To have a thorough overhaul and repair, including new boilers and the substitution of heavy R. F. guns for her present armament.

AURORA.

To receive a new battery of modern guns and to have smoke pipes lengthened 16 feet.

LEANDER.

Undergoing extensive repair at Chatham. Ten 6-inch R. F. guns are to be substituted for her 6-inch B. L. R., and 3-pounders will be substituted for the Nordenfelts; in addition to which the ship is also receiving extensive repair.

MERCURY.

To have a complete refit, including modern R. F. guns. Estimated cost, $104,619.

TORPEDO BOATS.

LAUNCHES.

The launches of the following first-class torpedo boats (destroyers) have been noted: *Brazon*, *Chamois*, *Earnest*, *Crane*, *Electra*, *Foam*, *Griffon*, *Locust*, *Mallard*, *Recruit*, *Star*, and *Whiting*.

STEAM TRIALS.

The following first-class torpedo boats (destroyers) have been tried, with results as shown, these results being the mean of six runs over a measured mile: *Desperate*, 30.43 knots; *Quail*, 30.38; *Sparrowhawk*, 30.56; *Salmon*, 27.88; *Snapper*, 27.91; *Swordfish*, 27.12; *Thrasher*, 30.36; *Virago*, 30.57. These results were not obtained on first trial in every case.

ITALY.

The budget presented by the minister of marine for fiscal year July 1, 1897, to June 30, 1898, calls for a total appropriation of $19,536,356, of which $3,667,000 is for construction. In this latter sum is included provision for continuing the construction of the *Ammiraglio di Saint Bon*, *Emanuele Filiberto*, *Puglia*, *Agordat*, *Coatit*, *Carlo Alberto*, *Vettor Pisani*, *Giuseppe Garibaldi*, and the *Varese*, for the construction of torpedo boats of the "destroyer" type, and for first-class torpedo boats.

JAPAN.

It is reported that an order has been placed with the Thames Iron Works and Shipbuilding Company for a battleship of 14,500 tons displacement, and also that the Japanese Government has ordered an armor-clad at the Vulcan Works, Stettin, and several torpedo boats from Schichau, at Elbing. December 31, 1896, a contract was signed in Washington, D. C., by the representatives of the Japanese Government and Messrs. Cramp and the representatives of the Union Iron Works of San Francisco for the construction by each of these firms of a cruiser of probably the following characteristics:

Length	feet..	374.5
Breadth	do...	48.75
Mean draught	do...	17.75
Displacement	tons..	4,760

Armament.—Two 8-inch guns on center line, one forward and one aft; twelve 4.7-inch in broadside, twelve 12-pounders, six 1-pounders, and five torpedo tubes.

They will have no armor on the side, but will have an armored deck of a maximum thickness of 6 inches. The contract calls for a forced draft speed of 22.5 knots, and they are to be delivered by the end of two years.

NANIWA.

The changes in battery mentioned on page 72, No. XV, have been made. Six-inch Armstrong R. F. guns of 35 calibers have been substituted for the 5.9-inch B. L. R. Cordite is supplied for these guns, the charge being 36 pounds, giving an I. V. of 2,200 feet. There are 120 rounds of ammunition for each gun. Sixteen shells for each gun are kept on deck, but no powder.

NETHERLANDS.

A program of reorganization of the navy has recently been published. Twelve protected cruisers of the *Holland* class (p. 51, No. XIV), modified; six armored vessels of the *Kortenaer* class (p. 59, No. XIII), modified; three coast-defense monitors of about the same type as the *Reinier Claessen* (p. 58, No. X); three coast-defense monitors of a type smaller than this; fifteen gunboats; fifteen 30-knot torpedo boats, and ten 18 to 20 knot torpedo boats are proposed. The principal data of the armored ships are as follows:

Length over all	feet..	287
Extreme breadth	do...	49.9
Draught	do...	17.7
Displacement	tons..	3,936
I. H. P.		5,300
Speed	knots..	16
Coal capacity	tons..	250

Their armament will consist of two 9.45-inch 40-caliber guns in hooded barbettes, one forward and one aft on the center line, the barbettes being 9.8 inches thick; four 4.7-inch 40-caliber R. F. guns; six 2.95-inch 40-caliber R. F. guns, and eight 37-millimeter.

The principal data of the larger type of monitor are:

Length over all	feet..	198.8
Breadth	do...	43.3
Draught	do...	10.17
Displacement	tons..	1,700
I. H. P		700
Speed	knots..	9.5
Coal capacity	tons..	60

Armament.—Two 8.37-inch 40-caliber guns, one forward and one aft, in barbettes of 7.87-inch thickness, with shields of 5.9-inch thickness; four 2.95-inch R. F. guns, and four 37-millimeter. Protective deck of 2-inch thickness.

The smaller type are to have the same dimensions as the other, except their draught will be 11.4 feet; displacement 1,406 tons. They will have only one 8.27-inch gun, which will be located forward; and aft, in place of the 8.27-inch gun, there will be a 4.7-inch gun, the other guns of the armament being the same as for the large type. Protective deck the same.

VESSELS LAUNCHED.

MATARAM.

This gunboat, of 810 tons, for colonial service, sister to *Nias* (p. 74, No. XV), has recently been launched.

RUSSIA.

VESSELS PROPOSED.

It is proposed to build the following vessels: An armored cruiser of 14,000 tons displacement, of the *Russia* type (p. 54, No. XIV), at the Baltic works. This vessel is mentioned on page 77, No. XV, as being a battleship; an Armored coast-defense vessel of the *General Admiral Apraxin* type, 4,126 tons (p. 55. No. XIV), at the new admiralty yard at St. Petersburg; a battleship of the *Sessoi Veliki* type, 8,800 tons (p. 67, No. XIII), but to be of 11,500 to 12,000 tons displacement, to be laid down at Nicolaef; a third cruiser, of the *Diana* class, 6,630 tons (p. 78, No. XV).

VESSELS LAUNCHED.

ROSTISLAV, 8,880 TONS.

(Page 77, No. XV.)

This battleship was launched at Nicolaef September 2.

SVETLANA, 3,828 TONS.

(Page 78, No. XV.)

This cruiser was launched December 4 from the works of the Forges et Chantiers, at Havre.

STEAM TRIALS.

TRI SVIATITELIA, 10,600 TONS.

(Page 68, No. XIII.)

This battleship has had a successful twelve hours' full-speed trial. Considerably more than the contract I. H. P. was developed, and a speed of 18 knots was obtained, 2 in excess of that for which the vessel was designed.

STANDART, 5,200 TONS.

(Page 58, No. XV.)

This imperial yacht has obtained, on forced-draft trial, a speed of 21.18 knots, with 10,600 I. H. P.

CHANGE IN ARMAMENT.

NAVARIN, 9,500 TONS.

(Page 38, No. IX.)

This battleship has had her secondary armament changed so that it now consists wholly or in part of eighteen 3-pounders and ten 1-pounders.

GROUNDING OF THE RUSSIA.

(Page 54, No. XIV; 80, No. XV.)

The 12,130-ton armored cruiser *Russia*, while proceeding from St. Petersburg to Cronstadt in the latter part of October, went aground in Cronstadt Roads. At the time a westerly gale was blowing, and the water had banked up so that it was much higher than usual; but soon after the vessel grounded the wind died out and the water began to fall, leaving her hard and fast. Great exertions have been made to get her afloat, because of the danger of her remaining in the position in which she is during the winter months, when the harbor freezes over; but it appears that these efforts have been unsuccessful, although a recent report states that she has been floated.

TORPEDO BOATS.

PROPOSED.

Three first-class torpedo boats of the *Sokol* type (240 tons, 29 knots; p. 59, No. XIV; 83, No. XV) are to be constructed at the Vulcan Dockyard at Kalpino (Ijora Works), and two, perhaps four, first-class boats of the *Pernov* type, 118 tons, will probably be built at Nicolaef.

LIQUID FUEL.

Extensive experiments in the burning of petroleum fuel in torpedo boats have been made, and the success of these has been sufficiently marked to decide the Russian admiralty to use petroleum extensively, if not entirely, in their torpedo boats, and perhaps to some extent in their coast-defense vessels.

TRANSPORTATION BY RAIL.

Recently a torpedo boat was transported by rail from St. Petersburg to Sebastopol successfully, and it is now contemplated to send several more by the same route to strengthen the Black Sea fleet.

SPAIN.

The Spanish Government is bringing forward its ships as rapidly as possible. This is particularly noticeable in the *Cristobal Colon*, building at Genoa, upon which the work is being carried on night and day, 1,500 men being employed. Her boilers are to be of the Niclausse type. Spanish subjects residing abroad continue to contribute for making additions to the navy, and the Spanish colony at Buenos Ayres alone has contributed $400,000 for building a vessel, the plans of which have not yet been determined upon. The admiralty has had under consideration bids for the construction of a 11,000-ton battleship and a 6,500-ton cruiser, but as yet it does not appear that contracts have been made for these. As soon as the 6,500-ton cruiser has been decided upon, plans will be made by the Spanish constructors and the construction of a duplicate will be undertaken at Cadiz.

VESSELS LAUNCHED.

DONA MARIA DE MOLINA, 823 TONS.

(Page 86, No. XV.)

This torpedo vessel was launched at Ferrol, October 8, 1896.

PRINCESA DE ASTURIAS, 7,000 TONS.

(Page 85, No. XV.)

This armored cruiser, whose unsuccessful attempt at launching was mentioned on page 14 of Part I, No. XVI, has finally gotten into the water. After a month in her original position, having defied all efforts to complete the launch, she quietly slid into the water on the afternoon of the 17th of October, at high tide, apparently little the worse for her experience.

SHIPS REFITTING AND RE-ARMING.

PELAYO, 9,900 TONS.

(Page 207, No. V; 356, No. VIII.)

This battleship arrived at Toulon on November 29 for refit and rearmament. The work is to be done at La Seyne. She is to receive new boilers of the Niclausse system and a new battery of 5.5-inch Canet R. F. G. in place of the 4.7-inch B. L. R. Her heavy guns will remain as now installed, namely, two 12.6-inch 49-ton Hontoria B. L. R. in barbettes, one forward and one aft on center line of ship, and two 11-inch 33-ton Hontoria B. L. R. in barbettes, one on each side in the waist. There will be nine 5.5-inch R. F. G., of which eight will be mounted in broadside and one in the bow, replacing the present twelve 4.7-inch guns in broadside and the one 6.3-inch gun in the bow. The work of removing the boilers and guns has not yet begun, and it is estimated that when it has been seriously undertaken the ship will not be ready for service for perhaps a year. One hundred and fifty thousand five hundred and forty dollars has been appropriated for the new battery and ammunition and $289,500 for the new boilers and work on the hull.

On December 22 the statement was made in a ministerial newspaper that the extensive repairs to the *Pelayo* had been indefinitely postponed, because the time required to make them would be eight mouths, and that the most urgent small repairs to her present machinery, boilers, and battery would be hurriedly made, so that the ship could be available for service by the middle of February, 1897.

NUMANCIA.

This old ironclad is to be thoroughly renovated at La Seyne and made as completely modern as possible. The present armor of the ship is to be kept, but new boilers will be put in; the engines are to be overhauled and new battery installed. The new battery will probably be composed of four 6.3-inch Hontoria B. L. R., eight 5.5-inch Canet R. F. G., three 4.7-inch R. F. G., and smaller R. F. and machine guns. This ship is briefly described as follows: An old-style broadside ironclad, launched in 1863; length on load-water line, 314.9 feet; extreme breadth, 58.66 feet; displacement, 7,305 tons on a mean draught of 25.75 feet. She has a complete belt of iron armor 5.12 inches thick extending from 7.5 feet below water line up to spar-deck beams, with a wood backing 11 inches thick. Her total coal capacity is 1,370 tons; capacity at load-water line, 1,100 tons. Her original speed was 10 knots.

VITORIA.

This vessel is at La Seyne to receive complete renovation and to be brought up to date as nearly as possible. The work to be done is of the same character as that on the *Numancia*, above described, and it may be noted that in both of these cases it is urgently required that the work be hastened with all possible speed. The new battery will probably be composed of six 6.3-inch Hontoria B. L. R., six 5.5-inch Canet R. F. G., and six 4.7-inch Canet R. F. G., with smaller R. F. and machine guns. The *Vitoria* is an old broadside ironclad, launched in 1865, having a complete belt of iron armor 5.51 inches thick extending from 8 feet below the water line to the spar-deck beams. In addition, this armor is carried up just abaft the smoke pipes, so as to form a small redoubt for one gun on each side of the spar deck. The armor is backed by 14 inches of wood. She is 318.2 feet long on load-water line, 55.66 feet extreme breadth, with a displacement of 7,250 tons on a mean draught of 24.4 feet. She has a normal coal capacity of 885 tons, and originally had a speed of 11 knots.

TORPEDO VESSELS.

An order has been placed with Messrs. J. & G. Thomson, Clydebank, for the construction of two more torpedo vessels of the *Furor* type (p. 86, No. XV) modified, to be named the *Pluton* and *Proserpina*. This class is of the "destroyer" type of torpedo boat, but of larger displacement and heavier armament. When this last order is filled Messrs. J. & G. Thomson will have constructed six of these vessels for the Spanish Government, namely, the *Furor*, *Terror*, *Odaz*, *Osado*, and the two named above.

FUROR AND TERROR.

The torpedo-boat destroyers *Furor* and *Terror* were designed and built by Messrs. James & George Thomson, Limited, Clydebank, to the order of the Spanish Government. They have now completed their trials and have arrived in Spain. Although similar in general design to the "destroyers" of the British navy, there are several departures in detail and the vessels are in some respects more nearly akin to the torpedo gunboats. For example, they are fitted with teak upper decks in addition to a complete steel deck; double awnings for the whole length of the vessel, with side curtains hanging to the water's edge, electric lighting throughout, and a number of electrical ventilating fans for insuring a supply of fresh air to the officers' and crew's quarters; so that the vessels will be much more habitable than an ordinary torpedo-boat destroyer when serving in the tropical or semitropical climates for which they are intended. The contract provided that the mean speed should be determined by four runs on the measured mile and by a further trial of two hours' duration, during which the speed should not be less than 28 knots. It was further stipulated that a load of 75 tons should be carried on trials, which is more than twice the load required in the case of vessels of a similar type built for the British navy.

The vessels have a length of 220 feet, breadth 22 feet, and have a molded depth of 13 feet. The load displacement is 380 tons. The armament consists of two 14-pounder R. F. G., the one mounted forward on top of the conning tower and the other aft; two 6-pounder guns of the same type mounted on the broadside, and two 37-millimeter automatic R. F. G., one on the starboard and the other on the port bow. All these guns have been supplied by the Maxim-Nordenfeldt Guns and Ammunition Company, Limited, and are of the latest and most improved pattern. Their position in the ship is shown by the deck plans. The vessels are also equipped with two torpedo tubes, 14 inches in diameter, mounted on the upper deck, so as to fire off either side of the ship. The torpedo tubes are on the Schwartzkopff system. Four torpedoes are carried, and there is, of course, a complete installation of air-compressing machinery for charging them, the engines and pumps being in the engine room.

After some preliminary trials the *Furor* successfully passed her official forced draft trial on October 30. The mean speed of four runs on the measured mile exceeded the contract by about a quarter of a knot, and the revolutions were maintained without difficulty for the two hours' trial. The *Terror*, after a single preliminary trial, completed her natural-draft trial, and at the next succeeding trial successfully completed her official forced-draft trial. The natural-draft trials were of the same duration as the forced-draft trials, and it was provided by the contract that a speed of 21½ knots be maintained with the air pressure in the stokeholds not exceeding three-fourths of an inch of water.

THE SPANISH TORPEDO-BOAT DESTROYERS "FUROR" AND "TERROR."

CONSTRUCTED BY MESSRS. JAMES AND GEORGE THOMSON, LIMITED, CLYDEBANK.

Fig 2

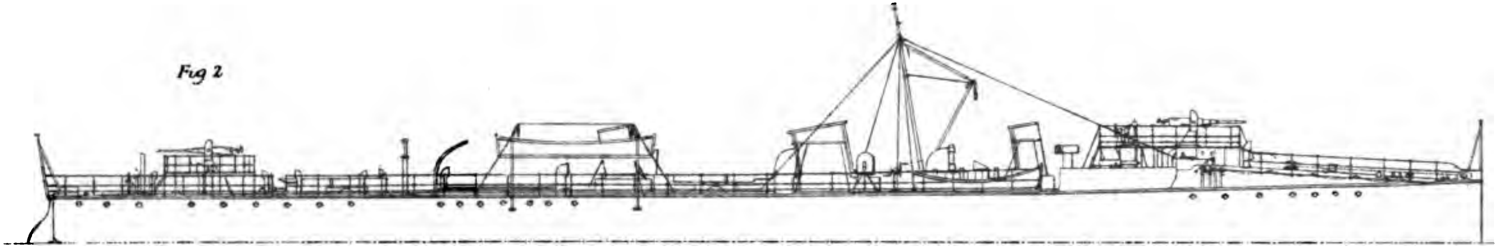


Fig 3. Upper Deck

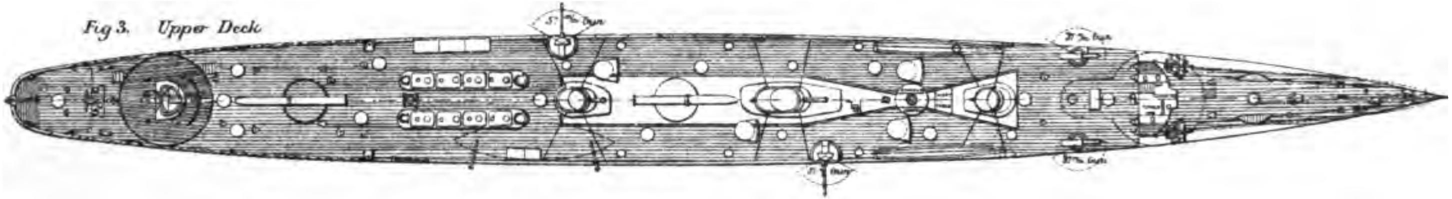
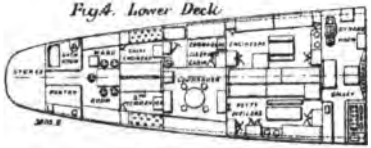
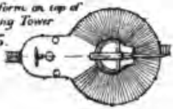


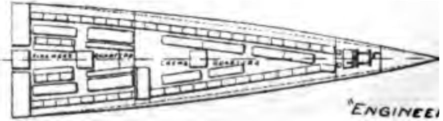
Fig 4. Lower Deck



Gun Platform on top of Conning Tower

Fig. 5.





"ENGINEE

It was found that this speed could be maintained with very great ease; indeed, the stipulated speed was exceeded by about a knot.

After the speed trials, the firing trials of the guns were carried out to the entire satisfaction of the inspecting officers. The terribly destructive nature of the fire, especially from the automatic guns, was very apparent, a perfect hail of projectiles of 37 millimeters, or about 1½ inches, in diameter being delivered by these guns, and continued so long as the person firing the gun kept his finger pressed on the trigger, the whole of the operations of loading and firing being automatically performed by the energy of the recoil.

The vessels are fitted with steam steering gear of the type usual in torpedo-boat destroyers. The engine, which is of the vertical pattern, bolted to the after bulkhead in the engine room, was supplied by Messrs. Caldwell & Co., Limited, of Glasgow. The steam capstan gear is driven by a horizontal 2-cylinder engine, supplied by Messrs. Napier Brothers, Limited, also of Glasgow.

The vessels are propelled by twin screws, each propeller being driven by an independent set of 4-cylinder triple-expansion engines situated in one compartment aft of the boiler rooms. Steam is supplied by four boilers of an improved Normand type, placed in two water-tight compartments. These are fired from two stokeholds, the furnaces of the forward and aft boilers discharging into separate funnels, while those of the two center boilers lead up to a common central funnel of larger size. The cylinders, which are entirely independent castings, are bolted together, and are stayed transversely between each other, and also to gusset plates in the wings, connecting the deck beams and the frames. A pair of struts extend from each of the high-pressure cylinders to gusset plates between the deck and forward bulkhead of the engine room, and similar ties secure each of the after low-pressure cylinders to the structure of the vessel. The cylinder bottoms are separate castings, and are bolted to the cylinders, and they, together with the cylinder covers and the top and bottom covers of the valve casings, are of cast steel. The pistons are of forged steel, turned all over, and are fitted with two Perkins metal rings. The piston and connecting rods are of wrought steel and are hollow. The crosshead pin is fixed into the forks of the connecting rod, and is of steel, casehardened. The piston-rod guide and head are forged with the rod, and the guide has machined recesses on the "ahead" side, which are filled with white metal. The "ahead" guide faces are of cast iron, with water circulation at the back, and the "astern" faces are of bronze.

The bedplates are of cast steel; each consists of two angle-bar-shaped castings, which extend the whole length of the engine and rest on longitudinal frames extending between the engine-room bulkheads. The main bearing frames extend between and are checked into these castings, being secured to them, as well as to the floors of the vessel, by fitted bolts. The main bearings are eight in number, and wrought-steel columns braced together near the center form the connection between the cylinders and these frames.

The crank shafts and pins are hollow, and are of steel. The high-pressure and intermediate-pressure cranks are arranged opposite each other, and each pair of cranks is forged in one piece. Balance weights are fitted on the crank webs, reducing the vibration to a minimum. The thrusts and propeller shafts are also of steel, and are hollow. The propellers are three-bladed and are of manganese bronze, each being cast in one piece.

The condensers are placed in the wings, and are of brass. The steam is condensed outside the tubes, and the water is circulated through them by a natural flow, due to the speed of the vessel through the water, two of Gwynne's pumps being fitted as auxiliaries. The air pumps are single-acting, and are driven by cranks off the forward ends of the crank shafts, discharging into a common hot-well tank.

The boilers are fitted with galvanized steel tubes. They are worked under forced draft on the closed stokehold system, the air pressure being applied by two single-breasted fans in each stokehold, placed one on either side on the bunker bulkheads. The engines are of the open vertical type, and air is admitted to the fans by large cowls placed directly overhead.

The boiler-feed arrangement is most complete, consisting of a main and auxiliary system of feed pumps and pipes, which are separate and entirely independent of each other. The main system consists of two of Messrs. G. & J. Weir's special feed pumps, placed at the forward end of the engine room. Each draws from the hot-well tank through a Harris patent feed-water filter, discharging either to the boilers in one compartment direct or through one of a couple of Messrs. Weir's feed-water heaters, situated on the forward engine-room bulkhead between the pumps. The feed-water discharge to each boiler is controlled by a special automatic feed-regulating arrangement, which keeps the water at a steady level in the boiler, greatly relieving the engineer in charge. For the auxiliary system a similar feed pump is placed in each boiler room, and each pump is connected by separate pipes with the reserve fresh-water tank, the hot-well tank, and the sea, and discharges direct to the boilers. The pump in the after boiler room also discharges to the deck, and serves the purposes of a fire pump.

The main steam pipes are of galvanized steel. An independent pipe extends between each boiler room and one set of engines, and each pipe is fitted with a stop valve and steam separator on the engine-room bulkhead, thereby insuring dry steam in the engine. There is also a connecting pipe between the main steam pipes, and an equilibrium valve at each high-pressure cylinder. An independent auxiliary steam pipe supplies all the auxiliary engines, except the main feed pumps, and the exhaust steam is led by a system of pipes to either of the main condensers.

A large evaporator is situated amidships, on the after engine-room bulkhead, capable of evaporating 3,150 gallons of fresh water per day, with a distilling condenser beside it which can supply 560 gallons per day of pure aerated fresh water, chiefly used for ship purposes, the remainder of the vapor being condensed in the main condensers to serve as make-up feed. A separate engine, with pumps, is also fitted for maintaining the water level in the evaporators, circulating the condensing sea water, and pumping the drinking water into the ship's tanks. An auxiliary air pump is fitted to each of the circulating pumps, and is connected to the bottom of the main condensers discharging to the hot-well tank. On the after engine-room bulkhead there is also a duplex bilge pump for clearing out the bilges of the engine and boiler rooms, and ejectors have also been fitted to each compartment, so that in case of excessive flooding the water may be rapidly got rid of.

The supervision of the trials, on behalf of the Spanish Government, was in charge of the Spanish naval commission, under the presidency of Commodore Camara. The constructive department of the Spanish navy was represented by Captain Talero, and there were also present Captain Peral and Captain Carlier.

SWEDEN.

VESSELS PROPOSED OR BUILDING.

NJORD AND THOR.

Orders have been given for the construction of these two armored vessels of the *Oden* type (3,400 tons, p. 77, No. XIII). Each will have a battery of two 9.85-inch guns in turrets, one at each end; six 5.9-inch R. F. G.; ten 6-pounders; four machine guns, and one submerged torpedo tube.

ORNEN, EJDERN, AND JARNAN.

These are torpedo vessels provided for in the estimate of 1896–97, of which notice of the launch of the first and the beginning of the construction of the other two has been given.

IV.

NOTES ON ORDNANCE.

By Ensign LAY H. EVERHART, United States Navy.

Staff Intelligence Officer.

GUNS AND MOUNTS.

FRANCE.

CANET'S R. F. FIELD GUNS, 1896.

The R. F. field guns of the Canet system, 1896 model, include the following pieces:

Gun.	Length in calibers.	
	Long gun.	Short gun.
	Calibers.	*Calibers.*
75-millimeter (2.95-inch)	32	24
70-millimeter (2.76-inch)	32	24
65-millimeter (2.56-inch)	35	30

The carriages for these guns are particularly characterized by the employment of what are called "elastic" trail pieces.

The following are particulars of the 75-millimeter gun and mount:

	Long gun.	Short gun.
Weight of gun ... pounds	727.5	551
Weight of gun carriage ... do	1,433	1,102.3
Weight of gun and carriage ... do	2,160.5	1,653.3
Weight of carriage, limber, and gun ... do	3,428	2,777.8
Weight of projectile ... do	11.5	10.1
Initial velocity ... foot-seconds	1,968	1,640
Pressure per square inch ... pounds	31,290	31,290
Number in gun's crew	4	4
Shots per minute	10	10

CONSTRUCTION.

Each gun is composed of a tube on which is shrunk a long jacket which receives the breech plug, a trunnion hoop, and a locking hoop.

BREECH CLOSURES.

There are three types of breech closure for these guns. (Figs. 1, 2, and 3.)

First type.—Fig. 1 shows the breech opened, closed, and dismounted.

This plug is a cylindrical screw, and the various adjustments are simple. This system admits of rapid dismounting by hand, without tools.

The opening and closing of the breech are made by direct action in two successive motions of the lever.

The firing mechanism is automatically cocked during the rotary motion of the breech plug. This system can be used either with cartridge cases or ordinary gas check.

Second type.—Fig. 2 represents this type opened, closed, and dismounted.

In this system we have a conical plug; it can be manipulated very rapidly, but one motion of the lever being required to open or close the breech.

The firing mechanism is cocked in closing the breech. A useful feature of the firing mechanism of this type enables the firing pin to be cocked or released without opening the breech.

The mounting and dismounting can be done rapidly by hand without a special tool. Spare parts of the firing apparatus can be substituted for broken parts with ease.

This breech mechanism is adapted to use for obturating either cartridge cases or ordinary gas checks.

Third type.—This system (fig. 3) was fully described and illustrated in No. XV, page 99, and is here reproduced so that the different systems may be readily compared. It is called the concentric-groove system.

This entirely new mechanism is of very simple working, and includes in all five pieces. It opens and closes with a single quarter turn of the lever; at the position of open the breech itself forms a loading tray. It is composed essentially of a plug in the shape of a spherical segment bounded laterally by two flat surfaces and on the back by a concave cylindrical surface. A series of concentric grooves cut on the lateral surfaces of the plug fit in grooves of the same shape, cut in the breech of the gun.

The plug is dismounted simply by unscrewing the stop bolt, clearly seen on the right-hand side.

The firing mechanism is similar to that described for the second type.

These three types of mechanism are furnished with extractors which

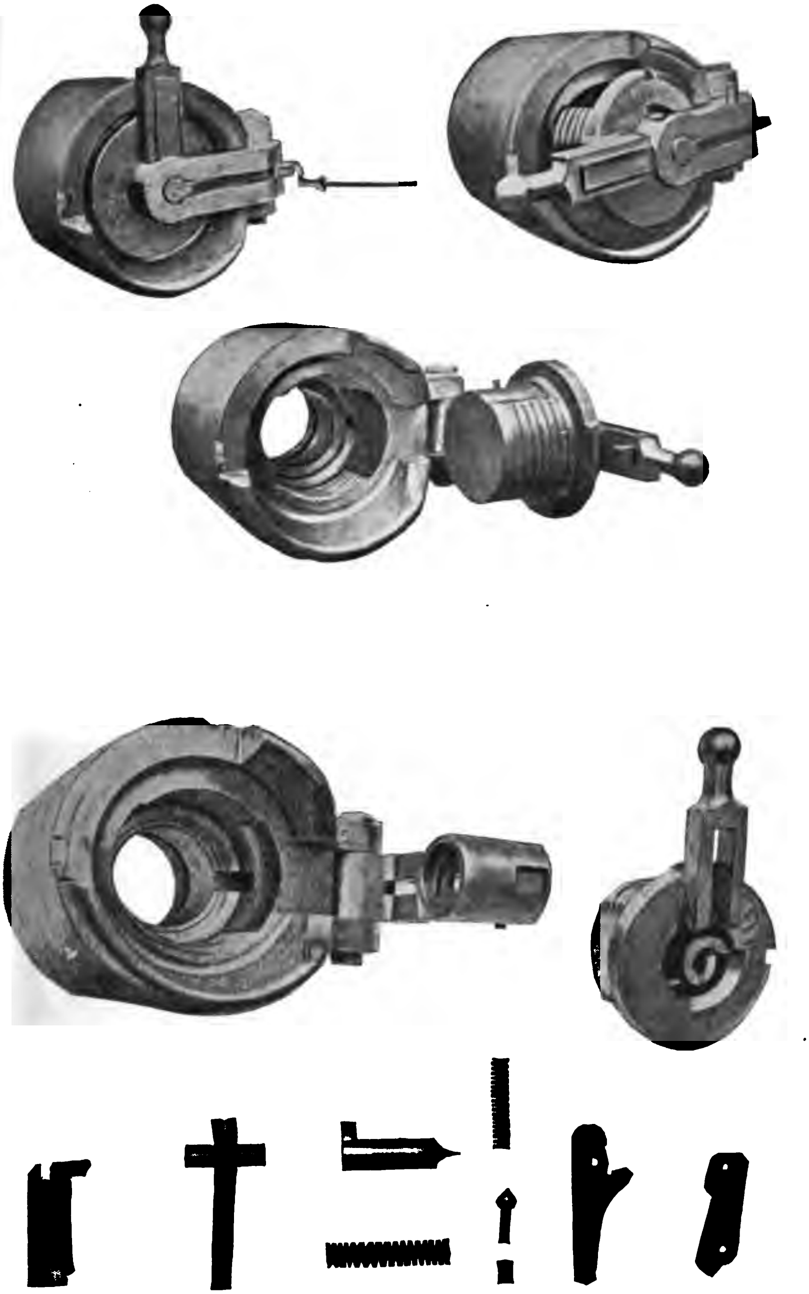


Fig. 1.—CANET'S BREECH MECHANISMS.

Revue d'Artillerie.

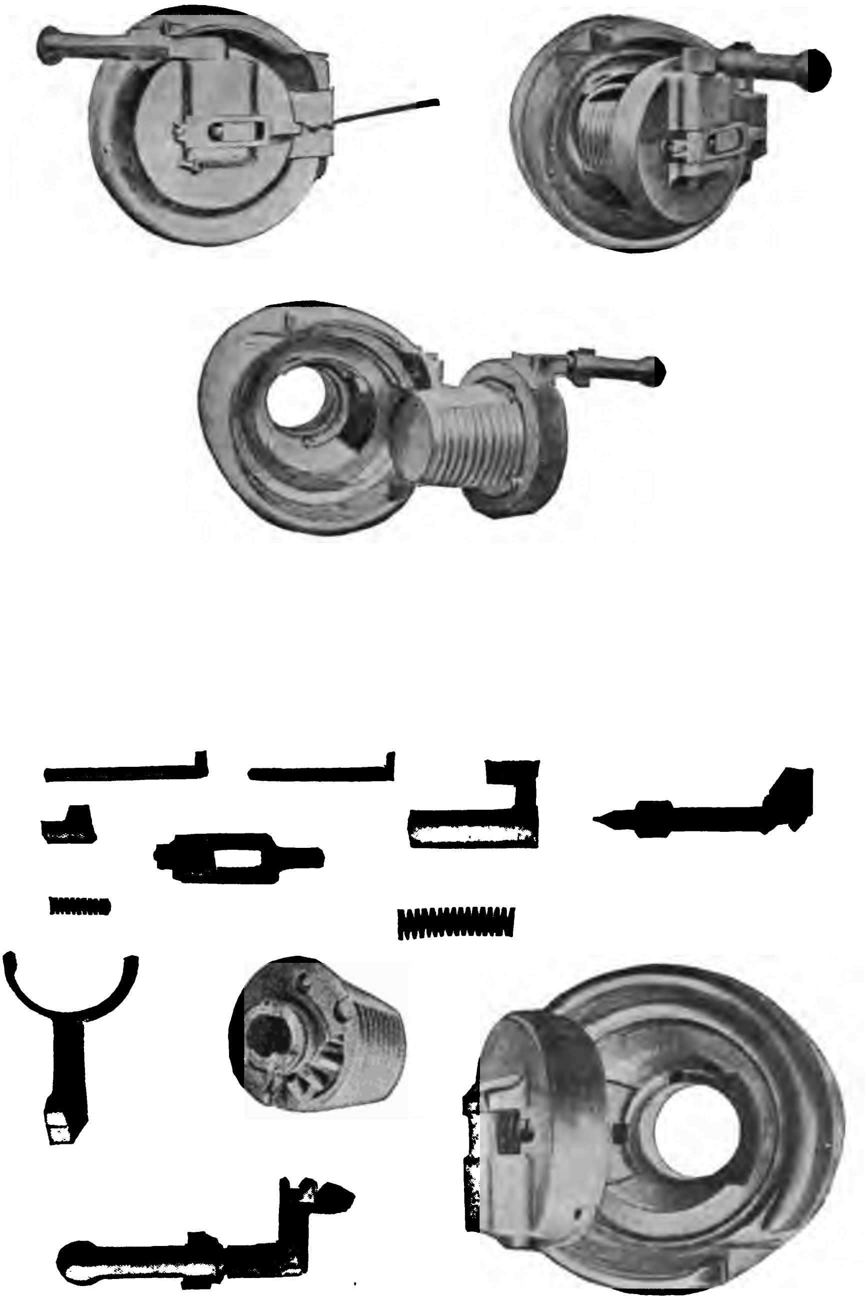


Fig. 2.—CANET'S BREECH MECHANISMS.

Revue d'Artillerie.

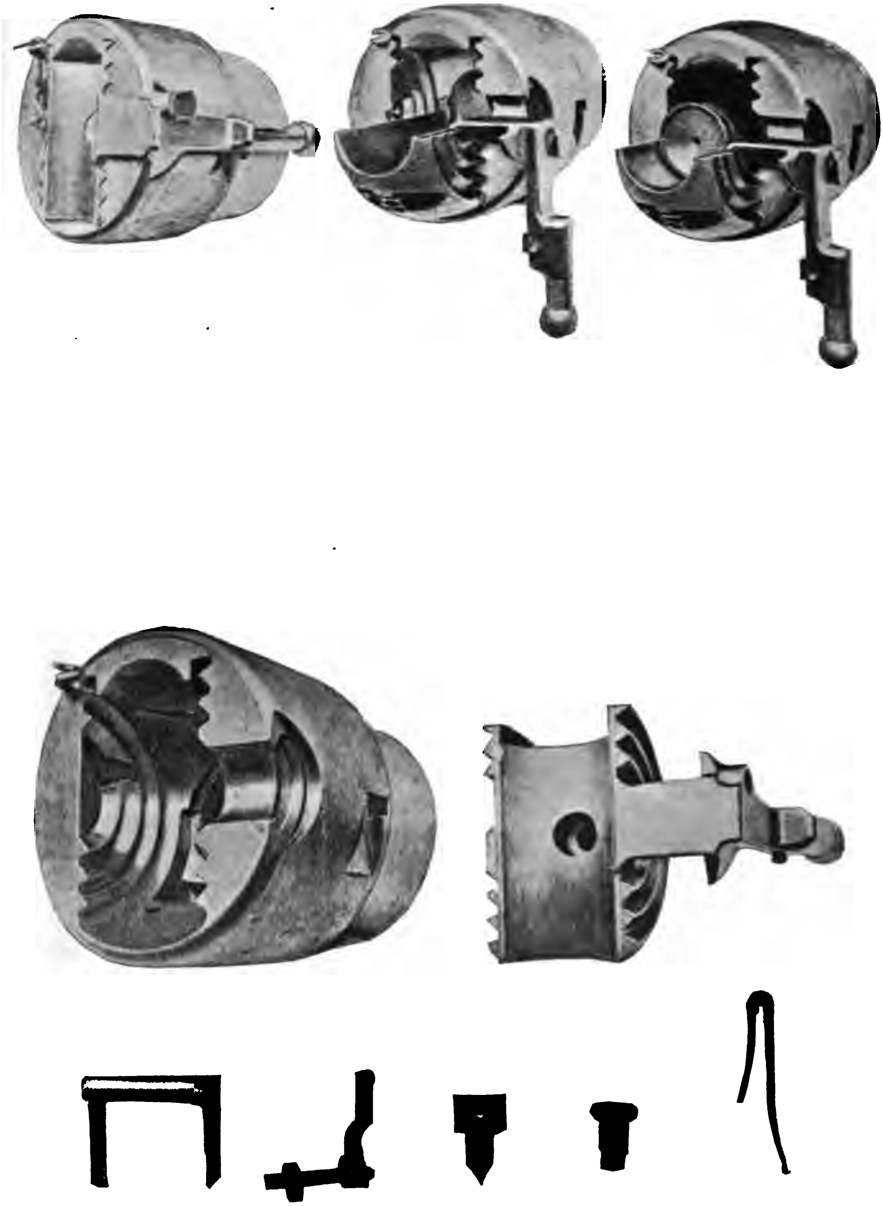
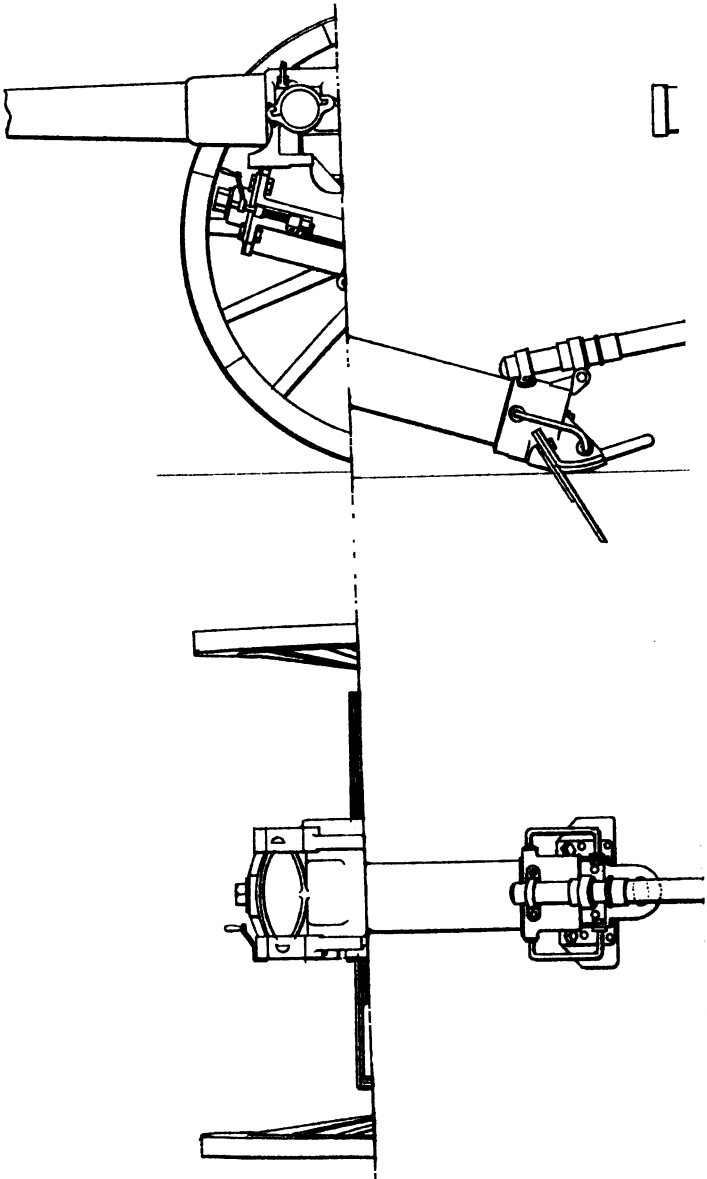


Fig. 3.—CANET'S BREECH MECHANISMS.

Revue d'Artillerie.



give an even and complete ejection of the cartridge cases; besides, they insure against premature fire, hang fire, and misfire. All three are equally well adapted to the use of percussion and electric primers.

The sights can be lighted by electricity at night.

THE CARRIAGE.

This gun carriage is called the "elastic trail" carriage, which name well defines its special features.

The trail.—The trail consists of two cast-steel tubes, one of which freely slides within the other under the action of recoil. This telescopic movement is controlled by means of a hydropneumatic brake. (Figs. 4, 5, 6, and 7.) The outer and larger tube is secured to the main body of the carriage, while the inner one terminates at its lower end with an inclined plate or spade, which enters the ground and takes the thrust of recoil. On the low end of the smaller tube, which is closed by a screw plug, is screwed a ring which carries the inclined plate, the two pointing rings, and lunette. The training lever, when the gun is limbered up, rests on the trail, and it has such a length that it bears against the rear face of the body of the carriage, thus making the system rigid.

Body of the gun carriage.—The body of the gun carriage is composed of the upper part of the trail and the axle, which are rigidly bracketed together. Above the axle is a circular rack, into which gears the training worm. The trunnions rest on a strongly made bracket frame, which pivots on the under body of the carriage.

Training and elevating gear.—The training mechanism consists of a worm gearing into the circular rack on the gun carriage, and forming part of a horizontal shaft; on this is mounted the handwheel, by means of which the gun can be trained within a field of 4 degrees each way. A little to the rear, and at the side of this handwheel, is a second one, which controls the elevation by means of a vertical screw, on the head of which rests the under side of the elevating and rear sight mass. The preponderance of the gun maintains this contact with the elevating screw.

Road brake.—The carriage is provided with a brake, to be used only on the road, and which must not under any conditions be tightened when firing. It is controlled by a crank handle, seen at the front of the gun carriage, which operates a transverse bar and two cams.

The axle.—The axle is of steel, curved in the center in order to pass round the tube beneath the gun carriage; it is also bent upward at the ends, so as to allow the use of wheels of a larger diameter than usual. The wheels are either partly of wood and partly of metal or entirely of iron. In either case a lubricating device of a special type keeps the bearings in good running order.

Recoil brake.—The hydropneumatic brake controlling the recoil is of a new and simple type, containing improvements resulting from the experiments that have been made with this gun carriage during the last few years. This brake requires no special attention. Its endurance has been demonstrated, it is claimed, by a number of prolonged trials. Its position in the interior of a strong steel tube protects it from shock and from external influences.

The operation of the gun carriage when firing is automatic. At the first round the inclined plate or spade enters the ground. According to the nature of the soil, the reaction of the first round produces a recoil which may vary, but is more or less insignificant. This first round fixes the inclined plate in position, and with it the trail. At each subsequent round all the movable parts of the carriage recoil freely, telescoping, and actuating the hydropneumatic brake, but without raising the wheels from the ground. As soon as the energy of recoil is absorbed, the return into firing position takes place, and the gun carriage resumes at the end of this movement the position it occupied before firing. The operation of this system is in no way affected when the gun is trained to the maximum angle of 4 degrees. When the firing is over, or if a rapid change in training becomes necessary, the spade is easily disengaged from the ground.

AMMUNITION.

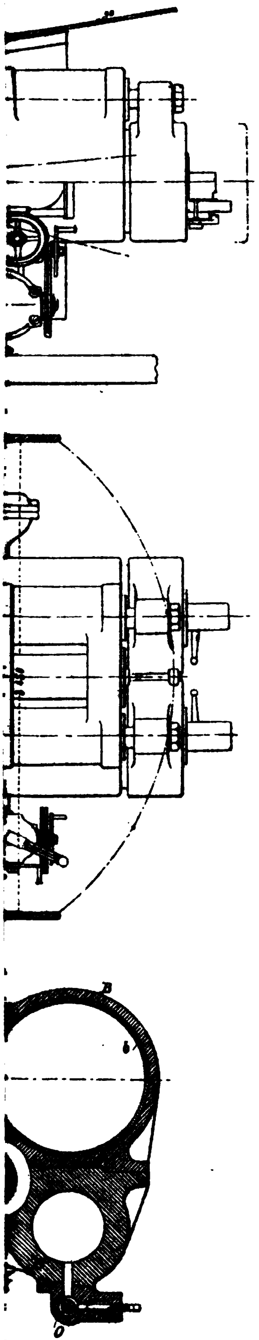
The ammunition used is of a new type. It consists of the two ordinary parts, projectiles and cartridge cases, packed in separate boxes for transport. Before loading, the projectile is fixed in the cartridge case by means of a special device. This method unites the advantages, it is claimed, of both systems of loading, the one in which the cartridge is complete, and the gun loaded in one movement; the other, where the cartridge case is separate from the projectile, and the gun is loaded in two operations; and it avoids the drawbacks attached to each. The cartridge cases and the projectiles are packed separately.

Cartridge cases.—The cartridge cases are made of brass or aluminum, and have either a percussion or an electric primer.

Projectiles.—In 100 rounds supplied, 90 are Canet shrapnel and 10 large-capacity steel shells for heavy charges. The shrapnel consists of a steel envelope inclosing a series of cast-iron disks, in which are set a number of hard-lead balls. A cast-iron-pointed head receives the fuze. The bursting charge is contained in a cavity at the back, which communicates by means of a tube with the fuze. Around this tube is a nonexplosive but inflammable substance which generates, at the moment of explosion, a thick volume of smoke visible at some distance, and which scatters, setting fire to combustable material. This shrapnel is fitted with an obturating ring near its head and a rifling band near its base.

The shells are of steel and have a solid head. They are fitted with base fuzes and have similar bands to those on the shrapnel.

Fuzes.—The fuzes are of brass or aluminum, and consist of a base percussion fuze for shell and a combination fuze for shrapnel. The time fuze is adjusted by means of an instrument which can be used



"Engineering."

without danger. It is in the form of a pair of shears (fig. 8) one leg of which ends in a hood, which entirely covers the fuze, while on the other leg runs a sliding piece holding a blade which cuts the slow match at the given point. A second sliding piece moves upon the lower edge of the hood, and can be fixed at any point by means of a screw; it has a notch, the hollow of which is of the same form as the projecting guide pin found upon many combination fuzes. When the two sliding pieces have been fixed at points corresponding to the desired length of fuze, all that has to be done is to cover the fuze with the hood and press the two legs of the instrument together.

Particulars of the 75-millimeter gun.

	Long.	Short.
Weight ... pounds	726	550
Total length ... feet	7.87	5.9
Total length ... calibers	32	24
Carriage:		
Weight ... pounds	1,430	1,100
Height of trunnions ... inches	39.4	39.4
Diameter of wheels ... do	52	52
Distance between wheels ... do	53	49
Extreme elevation ... degrees	15	15
Extreme depression ... do	5	5
Extreme train each way ... do	4	4
Number of men to serve gun	4	4
Ammunition:		
Weight of shrapnel ... pounds	11.4	10.1
Weight of shell ... do	11.4	10.1
Weight of bursting charge ... do	.88	.77
Weight of complete cartridge ... do	15.4	13.2
Initial velocity ... foot-seconds	1,968	1,640
Maximum range ... yards	7,400	5,500
Limber:		
Weight ... pounds	736	660
Number of rounds carried	35	35
Weight when loaded ... pounds	1,265	1,122

CANET'S DUPLEX R. F. G. MOUNT.

This mount is a development of mounts installed on the *Captain Prat*, where the guns were in pairs and trained together, but elevated independently. (Illustrated in No. XIV, p. 70.) In the present mount the guns are closer together, have but two trunnions for the pair of guns, and train and elevate together. (Figs. 9 and 10.) On this mount the 200-millimeter (7.87 inches) R. F. G. are but 34 inches apart between axes of bores. The maximum elevation is 15 degrees and depression 5 degrees. The mount carries a 5-inch inclined shield with a roof of 1.2 inches. The illustrations (figs. 9 and 10) represent two 200-millimeter (7.87 inches) guns on the duplex mount placed on a revolving platform. The London Engineering, in describing this mount, says:

The mount is composed of a twin sleeve B surrounding the rear part of the guns and carrying in front the trunnions that are supported by the side brackets of the top carriage. On the upper part of the sleeve (the sections, figs. 11 and 12, show a modified arrangement) are the brake cylinders and the compressed-air reservoir by which the guns are returned to battery automatically; on the lower part of the sleeve is the locking slide of the elevating gear. The recoil brakes are of the Canet system, with the central rod of variable section. The brake plunger has on each side a rod of different diameter. The smaller extends backward, and is connected to a crosspiece fixed to the breech of each gun; the larger, *d*, enters the cylinder during the period of recoil and drives out a part of the liquid it contains; this liquid acts through a pipe and valve O L on the piston of the central cylinder G, in which the air is compressed in front of the piston. At the end of the recoil the valve closes, but a second pipe, open to both sides of the valve and controlled by a lever outside, allows the liquid previously driven out to flow back into the brake cylinder under the influence of the air compressed in the receiver, thus returning the gun to battery. According to whether the by-pass pipe is opened or closed at the moment of firing, the guns are run out at once or are held back. The central variable rods are fixed to the projections on the upper part of the sleeve. They move during recoil inside the piston rods, thus constantly changing the area of the openings of the brake. The sighting devices are attached to the sleeve on the mount.

The guns are elevated by a toothed sector fixed under the sleeve; into this gears a pinion worked through a countershaft by means of a hand controlling wheel and a transmission chain. The turning platform rests on a live ring of hard steel balls, and it can be trained either by hand or by an electric motor. The mechanism of this part of the mount comprises a fixed toothed ring, two pinions gearing into it, and a third pinion, on the shaft of which is mounted, by means of a special compensating device, a helicoidal gear. An endless screw drives this gear and is itself actuated either by a pair of beveled wheels connected with the electric motor or by chain transmission worked by hand. By means of a clutch the hand or power gear can be thrown at once into operation. A supply of ammunition is furnished to the gun by a central endless chain moving with the platform and delivering at the side of the mount. Provision can be made for a store of projectiles being placed close to the platform, in which case only the cartridges would have to be delivered from below. This kind of mount, which is applicable to all calibers of R. F. G., possesses the following advantages: The weight and bulk of the mounts are reduced to a large extent, and consequently the weight and cost of the shield and local armor are also reduced. The axes of the two guns being as near as possible, the strain arising from firing one gun is reduced to a minimum, consequently the wear of the mechanism from training is also reduced.

ELECTRIC TURRETS.

(Fig. 9, page 100, No. XV.)

Nothing but success seems to mark the development of electric control for turrets, and it appears to be only a question of time before we find it in general use for all sizes of turrets.

The 12-centimeter (4.72 inches) Krupp guns on the *Sküold* are mounted in armored turrets, which are elongated to rear, thus balancing the turret, as well as giving the gun's crew a maximum working space. The turret and gun mount rest on a steel platform which revolves upon rollers. The whole is carried upon a hollow inverted cone, which terminates in a hydraulic pivot, around which the entire system revolves. The ammunition is supplied to the gun through this hollow cone by a hand hoist. The hand-training gear, which may readily be substituted for the electric, consists of a winch, worked by two men on the lower deck, which actuates a pinion that gears in a rack secured to the steel platform.

The electric manipulator or motor by means of which the training is effected is shown in section in fig. 13 and in operation in fig 9, page 100, No. XV.

The velocity of rotation of the turret is easily regulated by operating the manipulator handle, which introduces or suppresses resistances in a sufficiently progressive manner, whatever may be the abruptness of the opening of the current.

The instantaneous stopping of the turret is effected by turning the handle, which breaks the current and at the same time short-circuits the motor brushes. The motor, thus converted into a generator, opposes its work to the motion of the turret. A special arrangement then permits the training of the turret handsomely. The turret is automatically stopped at the extremities of its train.

THE HOTCHKISS AUTOMATIC MACHINE GUN.

The following is a more complete description of the same gun briefly described in Part I, No. XVI, page 15:

The gun consists of a single barrel screwed into the front of the receiver which contains the operating mechanism; below and parallel to it is secured a hollow cylinder which is in communication with the bore through a port drilled through the barrel a few calibers from the muzzle. Contained in this cylinder is a piston on which are formed suitable cams for operating the bolt, the firing, and the feed mechanism. On discharge, as soon as the bullet has passed the port connecting bore and cylinder, the powder gas enters a chamber in the front end of the cylinder and throws the piston to the rear, where it is held by an ordinary sear. On releasing the sear by pressing the trigger the piston is thrown forward to its initial position by the main spring. If the sear is held out of engagement by pressing the trigger and the supply of cartridges be kept up, the piston will have a constant reciprocating motion.

The piston engages with the bolt, and by its motion opens the breech, pushes the cartridge into the chamber, closes the breech, and fires. On opening the breech it extracts the fired cartridge case and brings a fresh cartridge to the loading position, performing, in other words, the functions of a man's hand when operating a straight-pull rifle.

The cartridges are carried in flat brass feed strips, having a length of about 15 inches, and each containing thirty rounds. Each feed strip is packed in an ordinary pasteboard box, from which it is fed directly to the gun.

The feed mechanism consists of a feed wheel, which engages in cams cut in the piston, and register with openings formed in the feed strip; each backward and forward motion of the piston brings a fresh cartridge in line with the chamber ready to be pushed home by the bolt and fired.

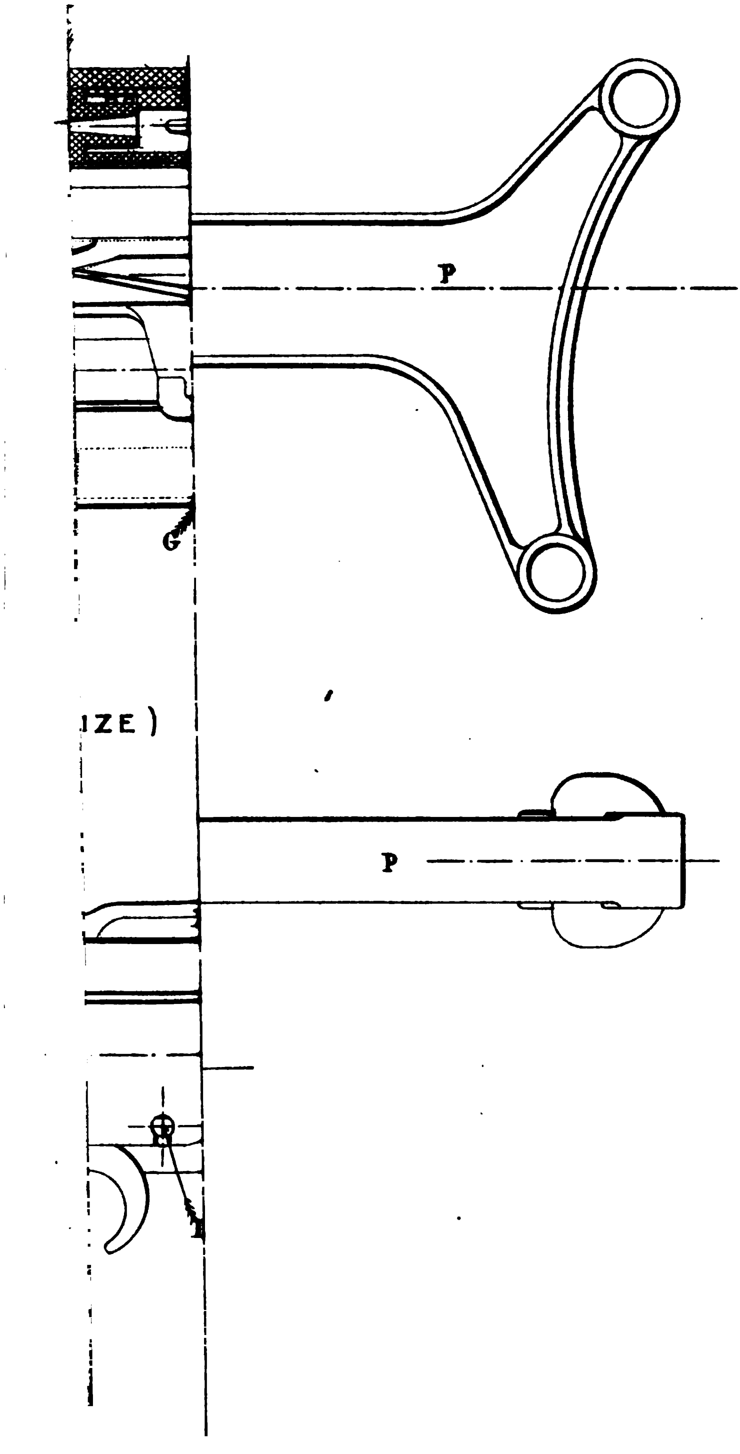
The gun is fitted with a shoulder piece or stock, which the gunner brings to his shoulder, and with a pistol grip and trigger for controlling the fire.

Two men are required to work the gun, one to load and the other to fire.

NOMENCLATURE OF PARTS.

[See figs. 22, 23, and 24.]

(A)	Barrel	With cylinder collar (*a*) for supporting front end of cylinder.
(B)	Receiver	With trunnions (*bb*) and seat for rear sight.
(C)	Cylinder	In connection with barrel through port (*c*).
(D)	Regulator	For varying capacity of cylinder chamber and consequently pressure on piston head.
(E)	Securing key	For barrel and cylinder.
(F)	Piston	Consisting of body with sear (*f*) and cams (f^1) for operating bolt, and stem with cams (f^2) for imparting intermittent motion to feed wheel.
(G)	Finger piece	For cocking piston by hand for first shot, or in case of a misfire.
(H)	Bolt	With locking dog (*h*).
(I)	Nose piece	Supporting base of cartridge.
(J)	Firing pin	Actuated by tang on body of piston.
(K)	Extractor	Mounted on bolt, and securing nose piece.
(L)	Ejector	Journaled in receiver, and actuated by bolt.
(M)	Mainspring	Throwing piston forward.
(N)	Trigger	With trigger spring (*n*).
(O)	Pistol grip	With trigger guard.
(P)	Shoulder piece	With breech cover (*p*).
(Q)	Breech-cover pin	Fixing shoulder piece and breech cover to receiver.
(R)	Safety lock	Preventing movement of piston.
	Feed mechanism,	self-contained, and consisting of:
(S)	Feed block	Containing the feed mechanism and forming a guide for the feed strips.
(T)	Feed-block key	Fixing feed block to receiver.
(U)	Feed wheel	For moving the feed strips and thus bringing each cartridge in front of chamber.
(V)	Stop	With stop spring (*v*) for arresting piston at end of its backward course independently of trigger.
(W)	Feed arbor	With pawl (*w*), engaging in ratchet on feed wheel, and pawl spring.
(X)	Cocking lever	For starting piston in case of need.
(Y)	Fore sight	Consisting of collar and leaf.
(Z)	Rear sight	With sight block.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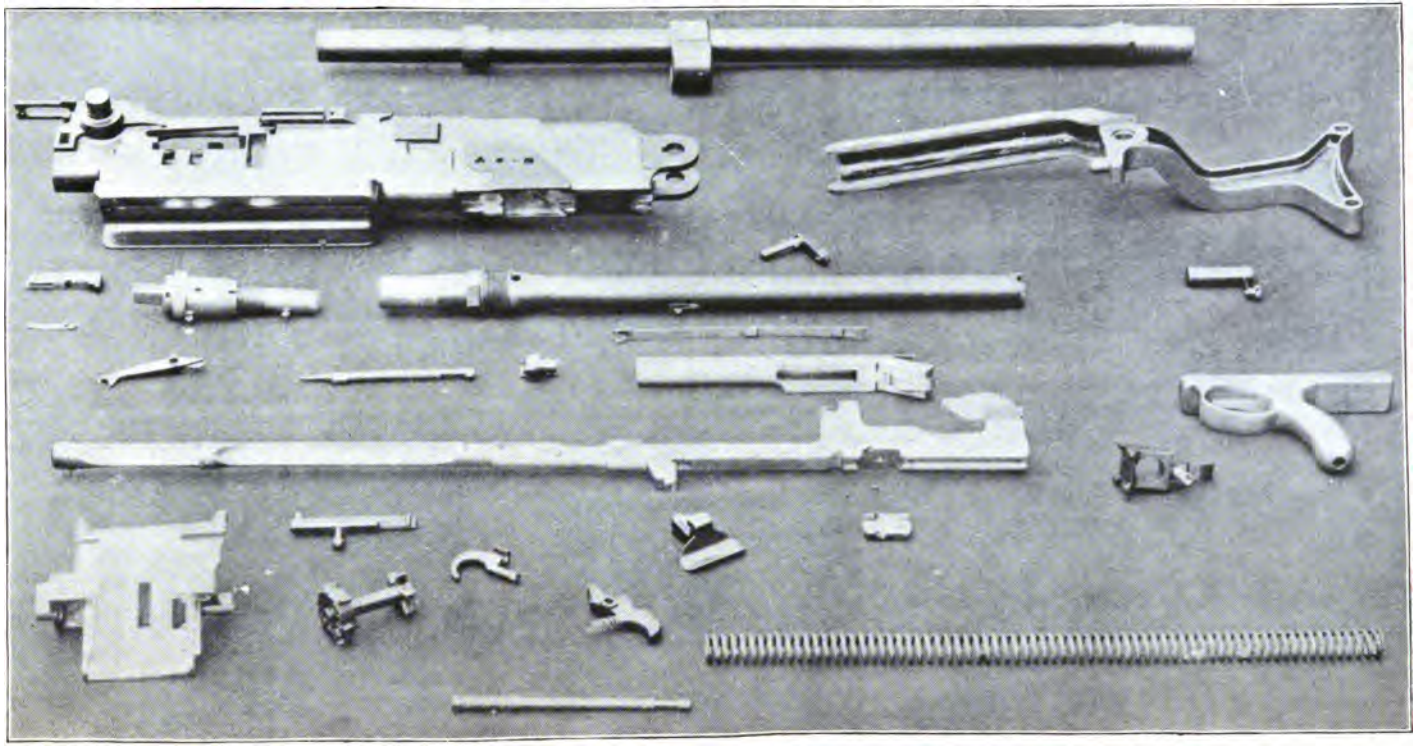


Fig. 23.—COMPONENT PARTS OF HOTCHKISS AUTOMATIC MACHINE GUN.

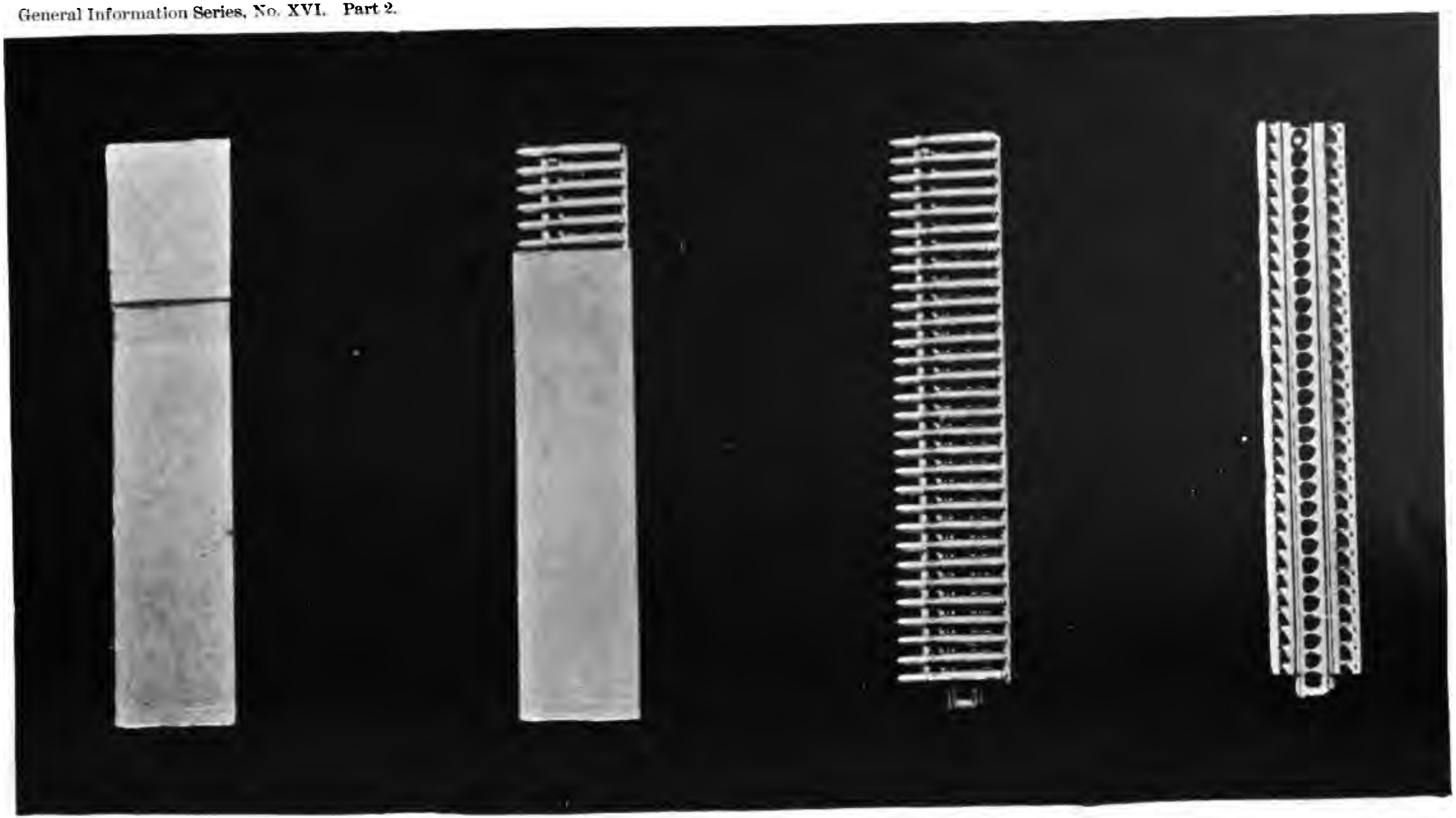


Fig. 24.—HOTCHKISS AUTOMATIC MACHINE GUN. FEED-STRIPS.

ACTION OF MECHANISM.

Assuming the breech to be closed, the gun is loaded by pushing a feed strip with cartridges into the feed block. The openings in the strip engage with the teeth of the feed wheel, which is now secured by the pawl engaging with the ratchet. Thus the first cartridge is held in position preparatory to the operation which brings it in line with the chamber and frees it from the strip. The stop which arrests the piston at the end of its backward motion is pressed down by the feed strip and so thrown out of action.

The gun is now cocked for the first shot by drawing the piston to the rear by means of the finger piece. This compresses the mainspring and causes the feed cam cut in the stem of piston to engage between two teeth of the feed wheel. Meanwhile the locking dog has been lifted by the unlocking cam formed on the body of the piston and the bolt withdrawn. The trigger engages with the sear, and the piston being held in its backward position, the gun is ready for firing.

On pressing the trigger the piston is released, and under the action of the mainspring is propelled forward, carrying with it the bolt; this, in moving forward, pushes a cartridge out of the feed strip into the chamber. When the cartridge is home the locking cam on the piston body brings the locking dog of the bolt to bear against the recoil blocks in the receiver. The breech now being closed and locked, the firing pin is driven against the primer by the tang on the piston and the cartridge is fired.

After the bullet has moved forward and passed the port connecting the bore with the cylinder, the powder gas drives the piston to the rear, withdrawing the bolt with its extractor, and ejecting the cartridge case. The piston is now held by the trigger, the mainspring compressed, and the gun is ready for the next shot.

The teeth of the feed wheel being engaged in the feed cams cut in the piston stem, each backward motion of the piston turns it one tooth and draws the feed strip forward bringing another cartridge to the loading position.

If the trigger be held back the piston is free to move forward again under the action of the compressed mainspring, and the fire will be kept up continuously and automatically until the supply of cartridges in the strip is exhausted.

The feed strip having been exhausted falls to the ground, and the stop which was held down by it rises and holds the piston in its backward position, independently of the trigger, and the piston is ready to move forward when the stop is again pressed down by a fresh feed strip.

In case of a miss fire the gun must be recocked by pulling back the finger piece; the defective cartridge is ejected by this motion and the firing may be continued.

In case a soft or defective fired cartridge case sticks in the chamber, and the gas pressure is insufficient to drive the piston back, it may be started by means of the cocking lever, and the gun recocked in the usual manner.

If it be required to withdraw a partially expended feed strip, the pawl is released from the ratchet of feed wheel by pulling the handle; the feed wheel is then free to turn backward, and the strip may be pulled out. This may be done with the breech either open or closed.

If it be required to lock the gun, turn the safety lock half a turn from "fire" to the "safety" position; the piston will be secured by the eccentric cam of the lock, either when the breech is open or closed.

The action of the mechanism depends in great measure on the pressure of the powder gas in the cylinder. The pressure may be increased by screwing down the regulator, or decreased by unscrewing the same. This varies the chamber capacity of the cylinder, and consequently the pressure.

MOUNTS.

Several types of mounts for this gun have been made, both for field, mountain, and naval service.

For land service the gun is generally used with a folding tripod, and transported on pack animals. (*See* figs. 25 and 26, and fig. 3, p. 14, Part I of No. XVI.)

On one pack is carried the gun, the tripod, the chest of spare parts and implements, and 600 rounds of ammunition.

On each ammunition pack is carried two chests, with 1,920 cartridges in feed strips, ready for firing.

The saddlery is similar to that used for light mountain artillery. The gun and tripod are carried in leather cases secured to the saddle and the accessory chest is attached to the saddle frame. They can be withdrawn without removing the cases from the pack. The ammunition is carried in two chests, secured above the cases.

The tripod consists of a socket, pivot, two legs, and a trail, the latter carrying a seat for the gunner. The gun forms, with the pivot and socket, a universal joint, and may be laid in any direction and elevation by means of the shoulder piece. The tripod can be converted into a litter by swinging the legs upward, and in this form can be carried by hand over considerable distances. With the legs swung upward, the gun may be brought close to the ground and fired, the gunner lying prone.

The tripod is fitted with an oscillator, which may be thrown in or out of gear, admitting a lateral movement up to 5 degrees.

Weight of gun pack:	Pounds.
(*a*) Saddlery, with gun and tripod, cases, waterproof cover, etc	66
Gun	33
Tripod	28.6
Chest, with accessories	22
Two chests, with 600 cartridges	63.8
Total	213.4

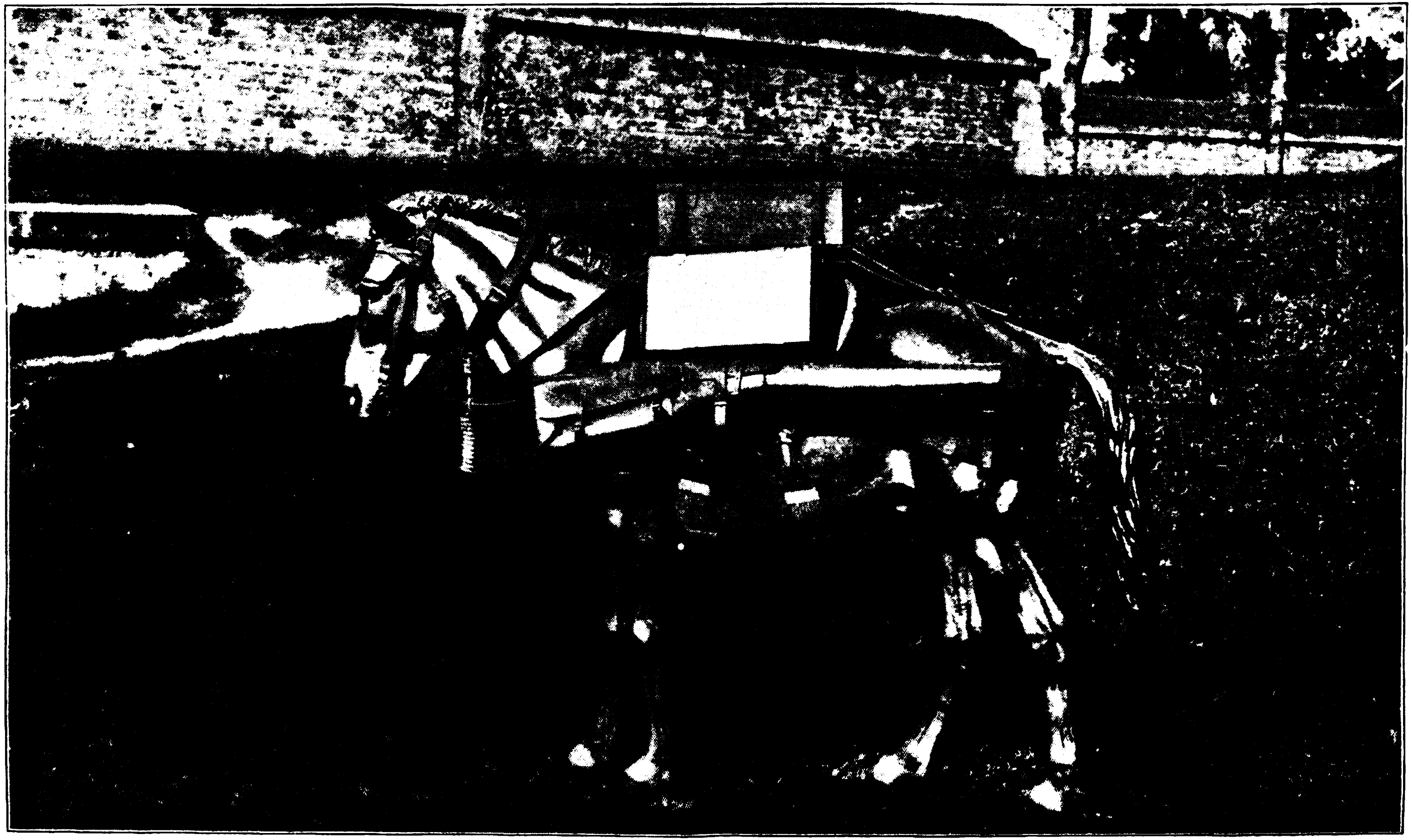


Fig. 25.—HOTCHKISS AUTOMATIC MACHINE GUN, ON MULE.

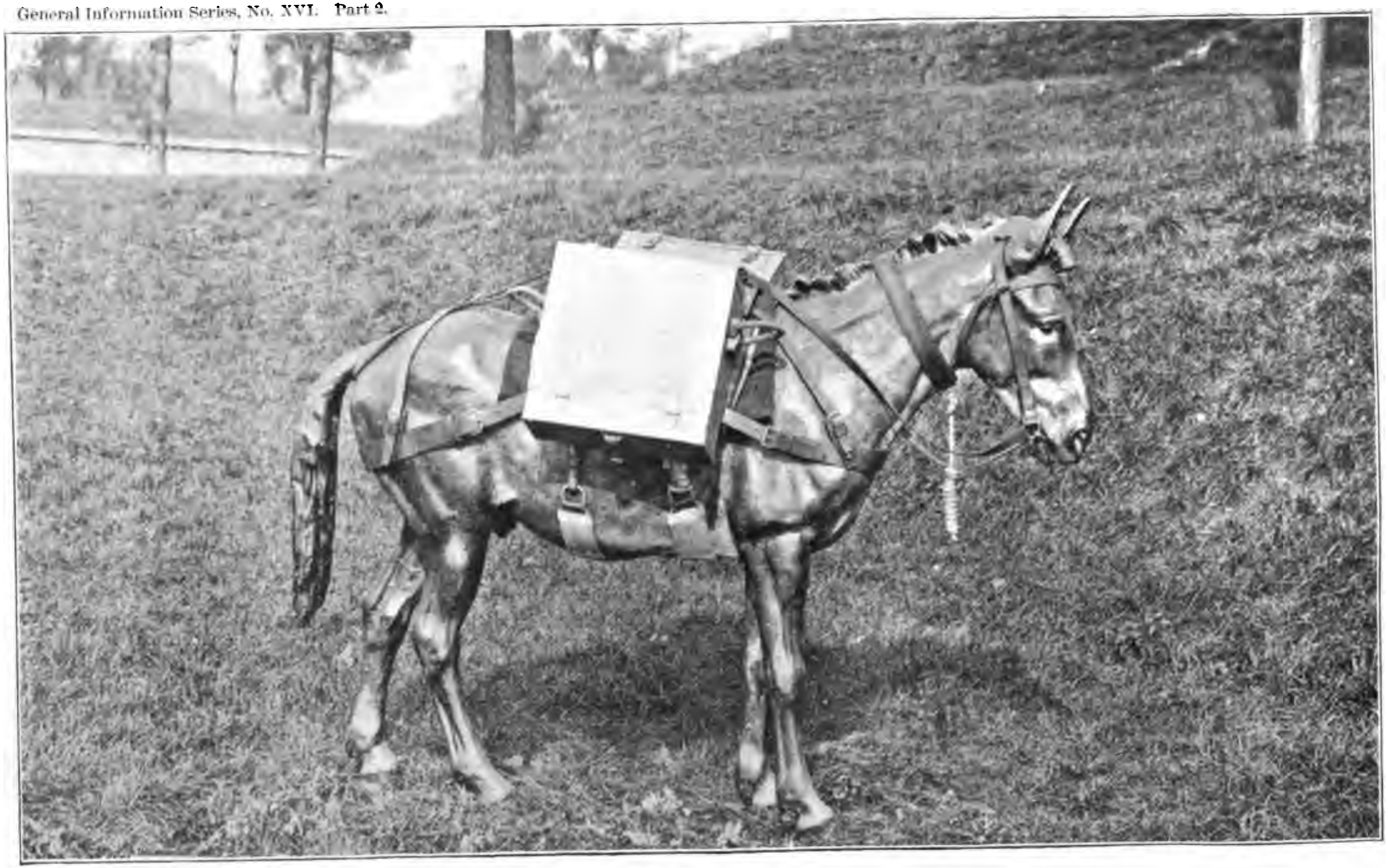


Fig. 26.– AMMUNITION MULE FOR HOTCHKISS AUTOMATIC MACHINE GUN.

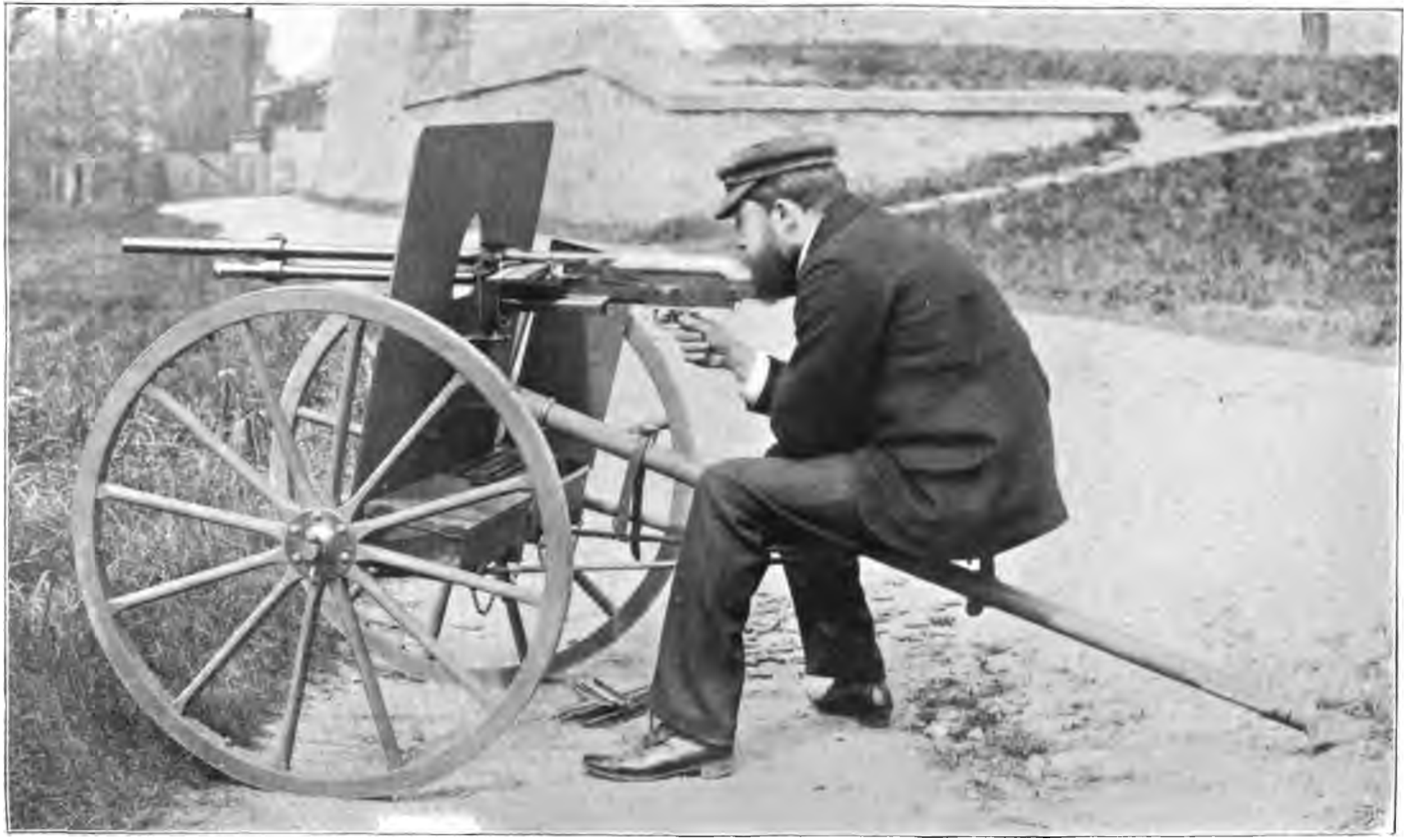


FIG. 27.—HOTCHKISS AUTOMATIC MACHINE GUN ON [illegible]

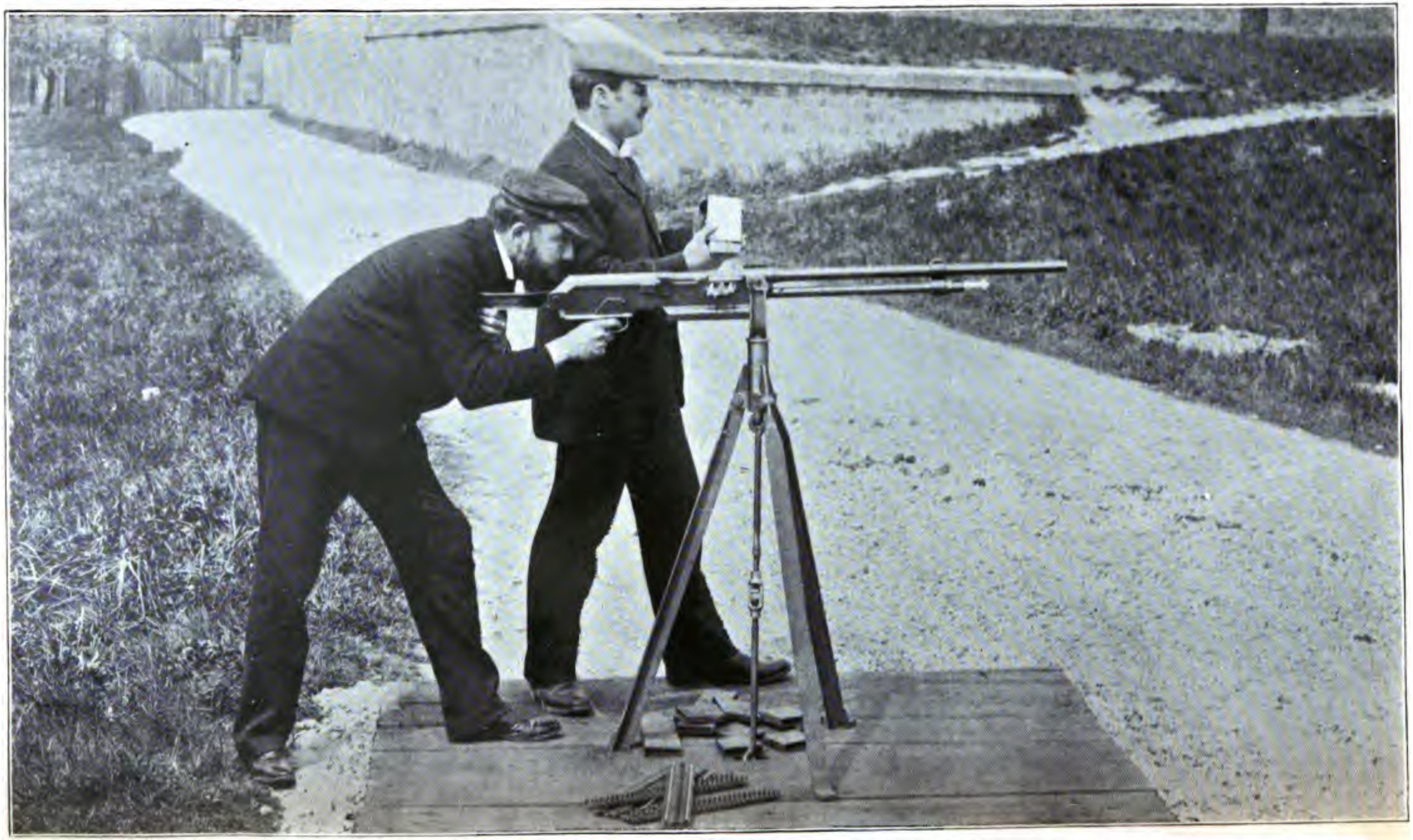


FIG. 28.—HOTCHKISS MACHINE GUN ON NAVAL TRIPOD.

Weight of ammunition pack:	Pounds.
(*b*) Saddlery, waterproof cover, etc	50.6
Two chests, with 1,920 rounds	213.4
Total	264

Traveling carriage for land service (fig. 27).—The traveling carriage consists of a shield made of special steel capable of resisting small-arms bullets. To this shield are riveted two axle arms, carrying the wheels, and a socket and pivot. To the socket is attached a light steel tube, forming the trail, the end of which is fitted with a trail eyepiece. The trail is strengthened by stays, and carries a seat for the gunner.

One thousand two hundred rounds of ammunition are carried in boxes fitted behind the shield. A light limber is provided, if required.

Naval tripod mounts (*see* fig. 28).—This consists of pivot and socket and three folding legs. A tie-rod with shackle and turn-buckle is attached to the socket, which may be connected with a fitting flush with the deck. When the turn-buckle is screwed up the tripod is rigidly secured. Weight of tripod mount, 35.2 pounds.

The tripod may be readily folded up and stowed.

Rail mount.—This consists of a pivot of same pattern as for the tripod mount, and a socket for bolting to the rail. Weight of rail mount, 17.6 pounds.

GERMANY.

The German navy department has decided that guns up to and including 24-centimeter (9.45-inch) caliber shall be rapid fire. An order of October 27, 1896, provides for the construction of Krupp R. F. G. of 24-centimeter (9.45-inch), 21-centimeter (8.27-inch), and 15-centimeter (5.91-inch) calibers. Heretofore the caliber of the largest R. F. G. installed on German ships was 15 centimeters (5.91 inches), and this recent decision may mean an increase of gun fire on board ship. The new armor clads *Kaiser Friederich III* and *Ersatz Friederich der Grosse*, as well as the armored cruiser *Leipzig*, will receive 24-centimeter (9.45-inch) and 15-centimeter (5.91-inch) R. F. G. The rearmament of all ships will probably take place to the extent of complying with this change.

GREAT BRITAIN.

THE 6-INCH MARK II R. F. WIRE-WOUND GUN AND MOUNT.

THE GUN.

These guns, as installed on board the *Prince George*, are of Elswick manufacture and admiralty design, except as regards the breech mechanism, which is an Elswick patent. The following descriptions are derived from the London Engineer:

They are 40 calibers long, the total length from breech face to muzzle being 249¼ inches. Each gun consists of a long tube, technically known as the A tube (fig. 15), bored out to 6 inches diameter for the greatest part of its length, the chamber section being tapered to allow of the free removal of the brass cartridge case. On the rear portion of this tube is shrunk a second tube, and round this is tightly wound the steel wire, the tension varying in successive layers as required. Over the wire is shrunk a jacket on which are cut steel keys to prevent any rotation of the gun by the inertia of the shell in the rifling. Finally, over the muzzle half of the A tube a chase hoop is shrunk on, and over the rear end of the jacket is screwed and shrunk the breech hoop, from the lower side of which projects a stout arm to which the piston rod of the recoil cylinder is secured.

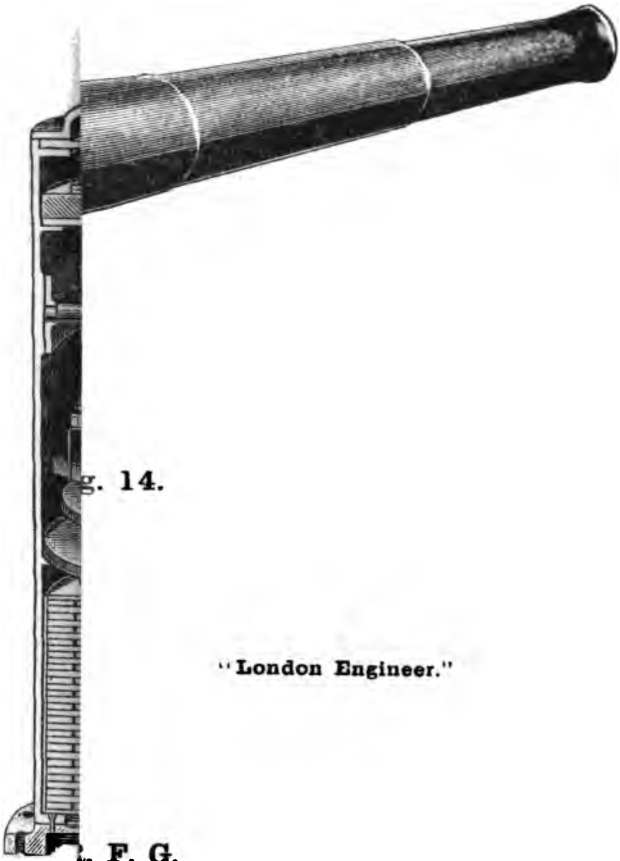
These guns fire 100-pound projectiles with 13¼ pounds of cordite, obtaining an initial velocity of 2,200 foot-seconds.

The breech mechanism is the same as that described in No. XIII, page 89.

THE MOUNT.

The mounts for the 6-inch, Mark II, R. F. G. (figs. 14, 16, and 17), are of Elswick design and manufacture. They are constructed almost entirely of forged steel, only the recoil cylinder and tank and the mechanism for training and elevating being made of gun metal and bronze. Those for the main-deck guns and gun-deck guns are very similar in construction, the main point of difference being in the shape of the shield and the absence of a sighting platform, this being rendered unnecessary by the lowness of the gun-deck mounts. The cradles complete are identically the same for both positions, and nearly all the details for the training, elevating, and sighting gear are perfectly interchangeable. A great variety of stores and spare parts is thus obviated, and the similarity of the cradles renders it possible to repair a mount holding an important position from one less advantageously situated or thrown out of action by some serious damage to the carriage or pedestal.

The 6-inch R. F. mounts on board the British ship *Prince George* consist of a solid-steel pedestal A (figs. 16 and 17), having a broad circular base bolted firmly to the packing or foundation ring, which is built into the structure of the vessel. In this pedestal is a vertical hole, bushed at the upper end with a gun collar B, extending laterally over the upper face of the pedestal and having its periphery cut as a worm wheel. Within the pedestal at the bottom is a hardened-steel ring, on which rest a number of steel balls. On these balls rests a second steel plate, attached to the lower face of the shank of the carriage. The whole weight of the moving parts—gun, cradle, and carriage—is thus taken by a ball bearing, and training is rendered very easy. The gun carriage is a solid-steel forked forging C. The shank passes into the pedestal, being supported at its upper end by the broad gun-metal bush and at its lower end resting on the balls. In the fork of the carriage arrangement is made to receive the trunnions of the cradle. Firmly bolted to the sides of the carriage are steel-plate brackets for



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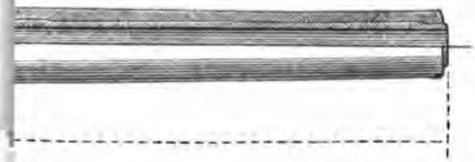


Fig. 15.

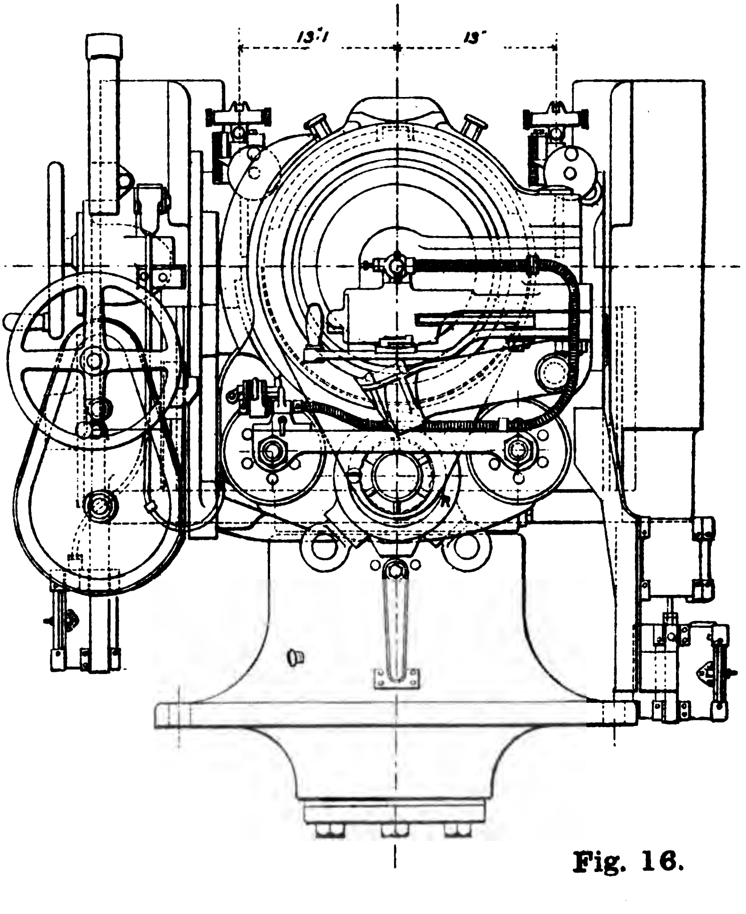


Fig. 16.

RK II, R. F. G.

rrying the actuating mechanism and the platforms also in the upper-ck mounts. The elevating and training operations are performed by e turning of two handwheels conveniently placed with regard to the oulder piece against which the gunner leans.

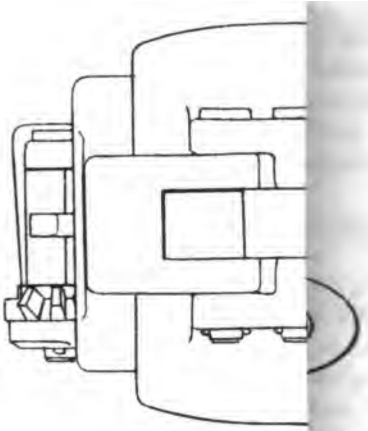
The training hand wheel is under his right hand, and revolves in a rtical plane nearly at right angles to the axis of the gun. It is con-ected with a rod, which passes toward the top of the pedestal by gear-g, where it terminates in a worm W gearing with the worm-wheel dge of the pedestal bush described above. As this bush is firmly fixed t is evident that the rotation of the worm will cause the whole mount o revolve horizontally. The elevating handwheel E is under the con-rol of the left hand. Elevation is produced by the revolution of a spur wheel M, gearing with the teeth of a circular arc attached to the cradle. The connection between this spur wheel and the handwheel is by a short train of wheels and a friction gear, consisting of several plates of gun metal and steel, alternately placed and pressed firmly together. One set of plates is attached to the spindle of the handwheel, the other to the spur wheel. The object of this arrangement is to allow the gun to move in a vertical plane without motion of the handwheel if for any reason it should be necessary to do so. It was originally employed in Vavasseur mounts to prevent any damage being caused by the muzzle of the gun, when at great elevation, recoiling against the top edge of the port, and has been maintained subsequently as a safety gear, though it very rarely comes into action. Normally the pressure between the plates is such as to make the connection practically rigid.

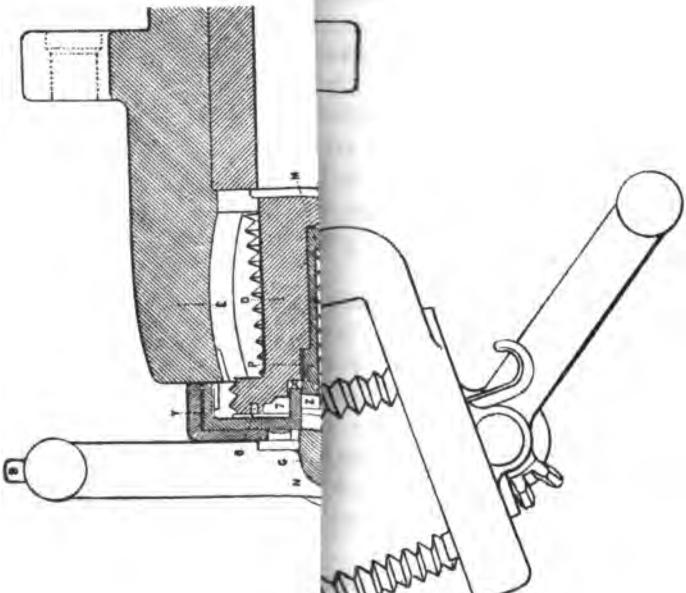
The gun cradle D is formed by a steel plate bent into a half circle. On its lower outer side at its rear end is attached the recoil cylinder R (figs. 16 and 17), of a high-class bronze, and on each side of this are placed the spring boxes. On the right side of the cradle is a gun-metal oil tank in direct communication with the recoil cylinder, and on the left side is attached the elevating arc referred to above. Within the cylinder is a piston having a very stout rod passing through a packed gland at the back end of the cylinder. On the end of the rod is a nut by which it is securely attached to a cross-bar and to the breech-ring of the gun. To each end of the cross-bar is also fastened a rod, which passes through a helical spring lying in each spring box. Projecting from the center of the solid bottom of the recoil cylinder is a bronze rod, known as the "control plunger," which enters into an axial hole drilled into the stout piston rod, but it is not a close fit. Out of the lower edge of the piston is cut a square notch, traveling over a valve key of peculiar shape lying on the lower side of the cylinder. In action the cylinder is filled with Rangoon oil. The springs normally hold the gun in the run-out position, and, consequently, the piston is kept close against the bottom of the cylinder. On firing, the pressure on the face of the breech screw drives the gun backwards. This action compresses the springs and pulls the piston along the cylinder, and by this means the oil is forced through the narrow passage left between the valve key and notch. By varying the area of this passage at every point the friction of the flowing oil is made to control the energy of recoil and to limit the motion to a length of 15 inches or thereabouts. After the limit of recoil has been reached the gun is immediately run out by the springs, the action in this direction being controlled by the plunger and a small automatic valve. The action is almost too rapid to be seen, and yet so nice are the calculations and adjustments that the mount only receives a slight shock, mainly taken up by the pedestal bush.

To each side of the cradle is firmly bolted a steel bracket N, rising a few inches above the upper edge. These brackets support the sights, one on each side. The form of sight used is known as the "bar and drum," and is illustrated in No. XIII, page 89. It consists mainly of a round steel tube pivoted near its center K to a bracket attached to the sight brackets on the cradle. The pivot, of course, only allows the bar to move in a vertical plane. To the front end of this bar is attached the fore sight, and to the back end the rear sight and the adjusting arc or scale Y. This latter is a steel piece in the form of the letter T, the vertical limb of the T being supposed long and curved at right angles to and toward the plane of the paper, and its lower end slightly inclined to the right. In the horizontal part the actual sight, or H, slides, being moved by a screw, and adjustment is thus made for the movement of the vessels and for the effect of wind. The slight bend to the right is to allow for drift. Teeth are cut in the curved vertical stalk Y, and by means of a pinion and worm and a small handwheel the sight can be moved to give the necessary angle of elevation. The 6 inch guns of the *Prince George* have maximum angles of 20 degrees elevation and 7 degrees depression.

A pistol grip is used for firing these guns electrically, and a lanyard for percussion firing. The gun can not be fired until the breech is fully closed and unless the primer is in working order. An electric sounder attached to the pistol grip P, and consisting simply of an armature beating on a magnet, tells audibly when the circuit is complete and the piece ready for firing. The batteries for firing and for lighting the electric-light sights are attached to the mount. The night sights consist of two tiny electric lamps, one red and the other white, which slip on over the day sights.

The shields for the main-deck guns have a circular front of 3¼-inch thick steel, and flat wings of thinner material; they have also a roof of steel 1¼ inches thick, slightly inclined, and formed in a circular arc of about 240 degrees. The gun projects through a port cut in the front of the shield, which is kept as small as compatible with the required elevation, by keeping the shield as close to the trunnions of the cradle as possible. The shields are attached to the mounts by bent steel stays or springs, which, giving under the blow, reduce the jar or





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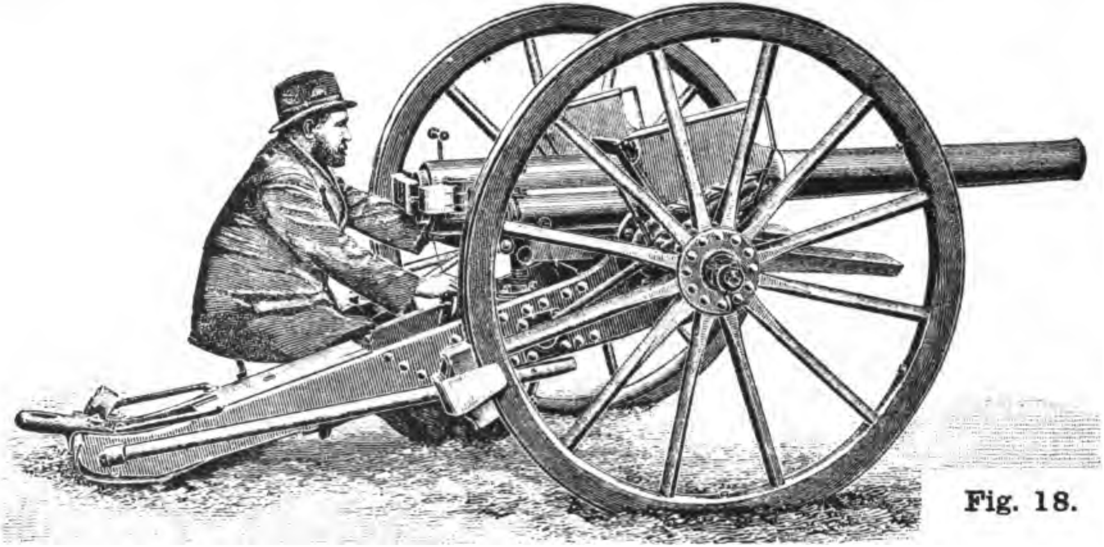

Fig. 18.

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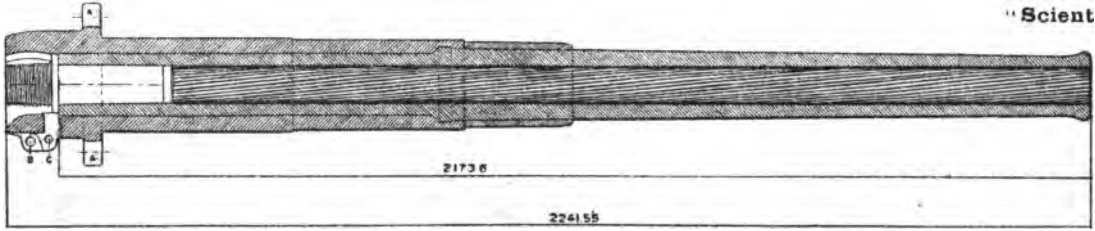


Fig. 19.

MAXIM-NORDENFELT 75 mm. (2".95) R. F. FIELD GUN AND CARRIAGE.

damage done by a shot, and so prevent the full destructive force taking effect. Ports for the sights are also cut through the shields.

These mounts are well balanced, the center of gravity being directly over the pivot. The effort required for training and elevating is very slight; provision is made for throwing the training gear out of action, and the mount can then be trained by a couple of men. A clamp through the pedestal box holds it in any desired position.

MAXIM-NORDENFELT R. F. FIELD GUNS.

The Maxim-Nordenfelt Company gives, in the London Engineer, the following data regarding their new R. F. field gun of 75-millimeter (2.95-inch) caliber:

The employment of fixed ammunition with primed metallic cartridge cases. Closing of the breech with an interrupted screw of simple and easy manipulation, and absolutely assuring extraction of the empty cartridge cases. Facilities for dismounting, without any tool, of the firing and breech-closing mechanism, admitting of the immediate change of a firing pin or of its spring. Recocking the gun without opening the breech. The employment of hydraulic recoil brakes, absorbing part of the recoil and reducing the jump of the carriage. Separate gear for training and elevating. Automatic brakes on the wheels. A light steel shield to protect the gunner against rifle bullets or shrapnel. Total weight of heavy equipment drawn not to exceed 3,968 pounds. Total weight of light equipment drawn—for horse artillery—not to exceed 3,307 pounds. Employment of a single projectile, with a few rounds of case shot.

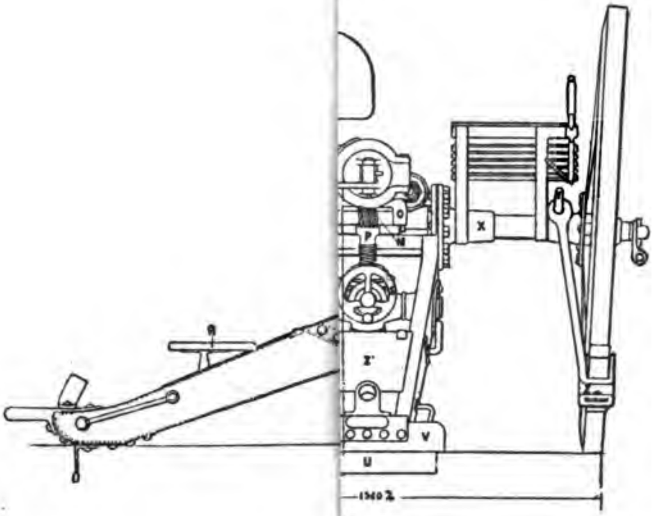
The gun (fig. 19) is the ordinary tempered steel type. Being intended to slide in a cradle which forms part of the carriage, it does not carry trunnions. The two projections A receive the piston rods of the hydraulic brakes, while upon the right side of the breech are found the lugs B of the hinge for the breech-closing gear, and the lugs C forming the supports of the extractor. The grooves of the rifling are thirty in number, uniform, and their angle of inclination is 6 degrees. Their width is 0.228 inch at the commencement, diminishes gradually to 0.193 inch at the muzzle, causing a continual compression of the driving ring during the passage of the projectile through the bore of the gun, which diminishes the chance of gas escape and consequently of erosion. The depth of the grooves is 0.228 inch.

The breech-closing gear is somewhat different to any hitherto employed. The breech screw D (fig. 20) is actually conical, but the largest diameter is at its interior extremity. Nevertheless it hinges out upon the carrier A without any longitudinal movement being required, the seating E being sloped away to a certain extent to admit of this. This arrangement is said to obviate all possibility of the breech plug being forced out by excessive pressures. The extremity of the lever F has a segmental pinion I engaging with a cogged segment K in the breechblock. The first portion of the movement then makes the block revolve through 90 degrees, the cogs of the pinion being placed eccentrically to its axis, so that they recede as the block goes out and preserve their engagement. A claw on the pinion now sets against the breech plug and brings it out, instead of making it revolve further. The 90-degree revolution brings the threaded portions of the screw against the smooth portions of the breech. The firing pin M is actuated by a spring pressing between the sleeve N and its solid point. Turning the breech plug presses the two helicoidal surfaces O upon projections P behind the firing pin and cocks the gun, the firing pin itself being prevented from rotating by the directing arm Q, which can only work longitudinally.

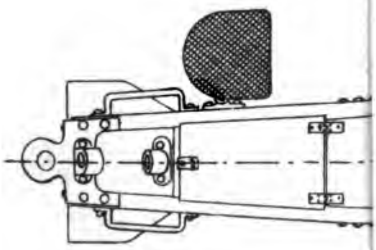
This directing arm is prolonged beyond the carrier and ends in a hook, by which the gun can be recocked in case of a misfire without opening the breech. The extractor R oscillates around an axis S fixed in the two lugs T; it has two extracting claws V. By the movement of the curved heel V the process of extraction, slow at first, finally ejects the empty cartridge case with a jerk. The ordinary trigger mechanism is seen at X, Y, Z, and the firing lever 2. A safety trigger, composed of a heel at the end of the prolongation of Y, slides in the groove 5 and prevents the act of firing until the moment when the breech is closed. The breech plug is prevented from oscillating unduly around its axis by a spring button 7. A bent lever, actuated by a spring, secures the working lever of the gun in its position against the breech when closed. The breech-closing gear is provided, when required, with an arrangement for preventing the opening of the breech in the event of a hang fire. It is only released by the shock of discharge.

The carriage has a jacket or cradle A (figs 18 and 21) of cast steel, in which the gun slides, fitted with hydraulic brake cylinders, favorably situated with regard to the axis of the gun and the line of recoil. The recoil in the cylinders is 12 inches. The gun jacket and hydraulic brake are upon a simicircular platform E, being secured by the clamps D and D′. The pivot E is the center of movement of the whole system for a training of 9 degrees. The lower part of the pivot F and the cushion G work by a screw upon the fixed cylindrical axis H, secured to both brackets of the carriage. It will be seen by a reference to the drawing that the axis of the gun is low down, and very near the center of the axletree, and consequently that the angle of the trail is a very acute one, if the wheels are of the ordinary height. This is a general advantage, as it tends to prevent jump. A cogged segment L engaging with the endless screw M, manipulated by the training wheel N, gives train through an arc of 9 degrees without altering the position of the trail. The elevating screw and wheel can be seen at P and S. They admit of 15 degrees of elevation and 5 degrees of depression.

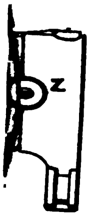
The sights are fixed upon the side of the jacket, and consequently do not recoil with the gun. This is a manifest advantage. The training

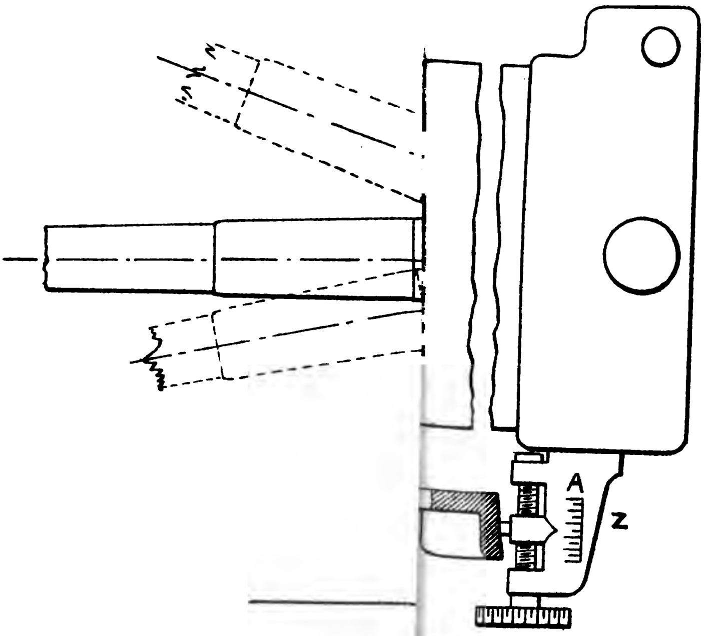


"Scientific American."



MGE.





32.

" Engineering."

and elevating wheels are so placed that the gunner, seated upon the seat R, can without any inconvenience elevate, having the right hand upon the wheel S, while with the left he works the training wheel N. The elevation once obtained, his right hand is free to pull the trigger and fire the gun. The extremity of the trail is provided with a short spade U for the purpose of further checking the recoil, fixed beneath a plate V sufficiently large to prevent the burying of the trail in the ground. The axletree carries at each side, near the wheels, a ring Y, the position of which is slightly eccentric in regard to its axis, each ring receiving the end of a drag iron Z intended to skid the wheels during firing. These drags are in all respects automatic, for the more the wheels have a tendency to turn during recoil the more firmly are they skidded. On the march the drags are hung at either side of the trail. Z′ is a trail box for tools, sights, spare parts, etc. The carriage is provided with a steel shield.

The following are the principal dimensions and particulars:

	Heavy gun.	Light gun.
Caliber of gun ....inches..	2.95	2.95
Length of gun........calibers..	30	24.50
Weight of gun and breech gear........pounds..	734	624
Height of axis of gun above ground........inches..	36.3	33.2
Weight of the carriage with wheels........pounds..	1,828	1,431
Angle of recoil upon the ground........degrees..	30	30
Weight of loaded projectile (shrapnel) ....pounds..	13	11.75
Weight of round complete of fixed ammunition........do....	16	14

The fixed ammunition is loaded horizontally in limber boxes, thirty-six rounds being carried with the heavy-gun equipment and forty-eight rounds with the horse-artillery equipment upon the gun limber. The initial velocity with the heavy gun is about 1,640 foot-seconds.

THE GAYNOR AUTOMATIC SIGHT.

This sight is for use on guns in seacoast fortifications which are at a high elevation above the sea level, so that the sight will automatically adjust itself to the required range in the act of elevating or depressing the gun in the operation of pointing at the object.

The high command is necessary to the working of an automatic sight. Suppose a gun to be at A (fig. 29), at the elevation of AH above the sea level, and pointed at an object C; then to point at some other object B the gun must be depressed through the considerable angle CAB, which motion is utilized to automatically adjust the sight. At some low elevation A′ the angle CA′B becomes very small and the automatic sight becomes unreliable, and at the sea level H there is no function of range available for an automatic adjustment of the sight.

In the Gaynor sight adjustment is provided for the rise and fall of the tide and for drift. The illustrations (figs. 30, 31, and 32) show the general arrangement. The sight complete is composed of the bell crank RPT, pivoted at P to the bracket B and the adjuster Z. The pin P is set at an angle to compensate for drift. The line of sight is over the edge PR. The bracket B is secured to the trunnion bracket and the adjuster to the gun itself, so that in moving the gun in elevation Z passes over the curved edge PT, which is so constructed as to give the sight the proper movement. Z always passing in the arc XY, which intersects the curve PT, causes the sight PR to move so that it always points at the spot the shot will strike.

The correction for the rise and fall of the tide is made by the adjuster Z (fig. 32). For every stage of the tide there is different curve PT, and all of these curves are represented on the face of the lower arc S of the bell crank. The scale A (fig. 32) shows the proper point of adjustment for a particular height of tide.

JAPAN.

R. F. FIELD AND MOUNTAIN GUNS.

The Société des Forges et Chantiers de la Mediterranée, of La Seyne, France, have recently supplied the Japanese Government with an experimental lot of field and mountain guns, similar in design to the Canet guns, previously described, but, it is claimed, of improved construction and reduced weight.

The field gun weighs, when fully equipped, about 3,140 pounds. The breech mechanism of the field gun is different from those described on page 2, as can be seen by referring to figs. 34 and 36. It is operated by a single movement of the lever at the right side of the breech, and on opening the breech the plug revolves downward. Its weight thus assists in ejecting the empty cartridge cases. The caissons are light and are fitted with special springs to protect the cartridges from damage by jolting. The caisson carries 35 rounds of ammunition on the limber and 60 on the body.

The R. F. mountain gun is shown in fig. 35. The gun itself is easily transported by one mule. The breech mechanism fitted to this gun is the same as that described on page 2, in which two motions of the lever are required to open or close the breech. The carriages are like the new Canet carriages, and the parts can be carried by two mules.

RUSSIA.

23-CENTIMETER (9-INCH) B. L. R. MORTAR.

By an order dated in November, 1896, this mortar has been definitely decided upon. It is of 23-centimeter (9-inch) caliber, and is 175.2 centimeters (69 inches) long, or 7.7 calibers. There are 52 grooves, the rifling being progressive (parabolic) through one turn of 102.2 centimeters (40.2 inches), and then constant. The initial angle of inclination

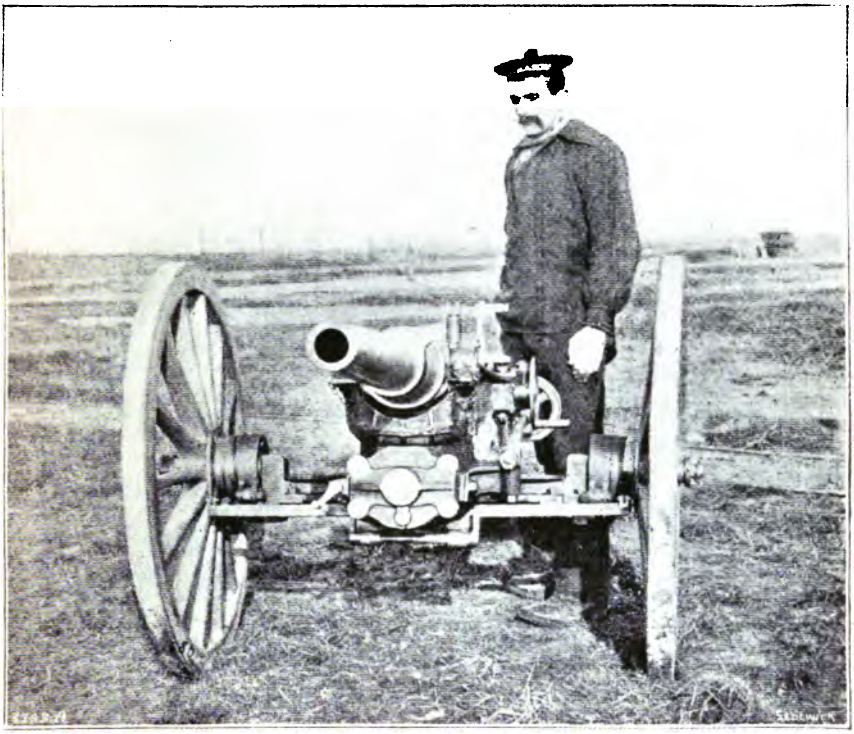


Fig. 33.

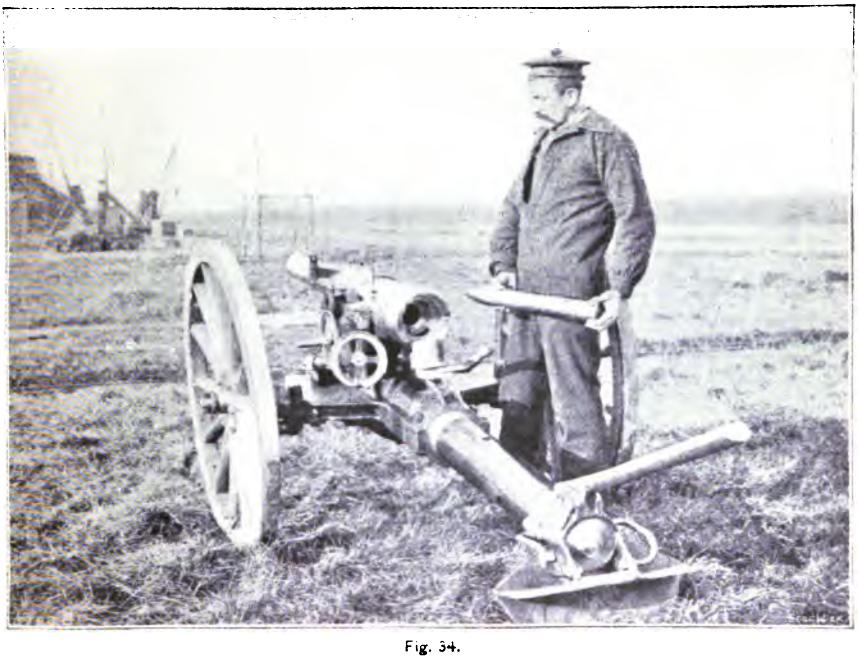


Fig. 34.

CANET FIELD GUN FOR JAPAN.

London Engineering.

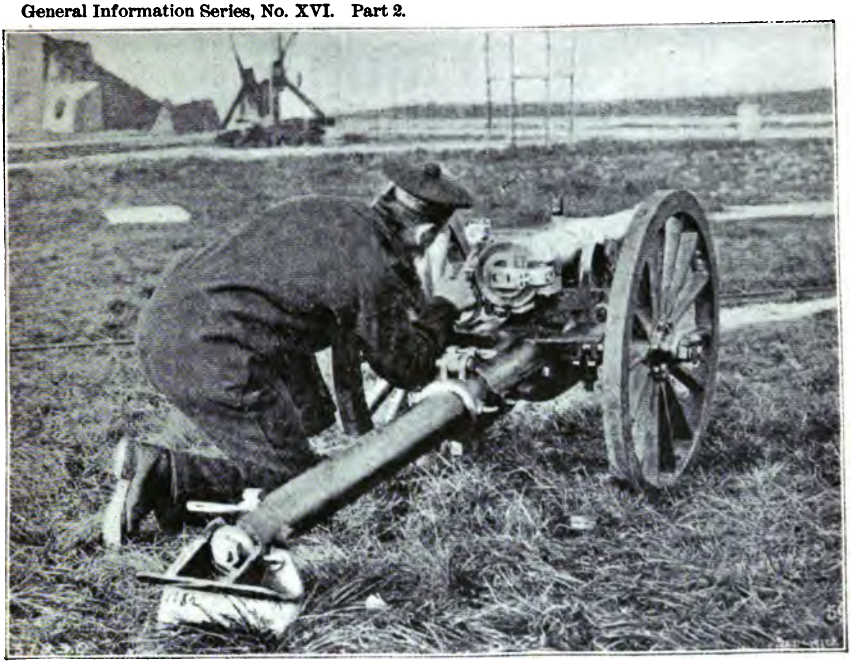


Fig. 35.

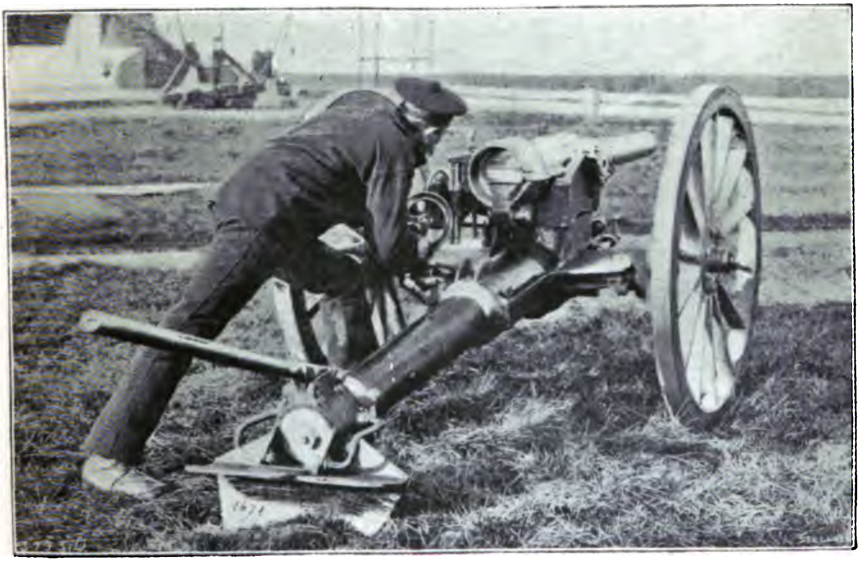
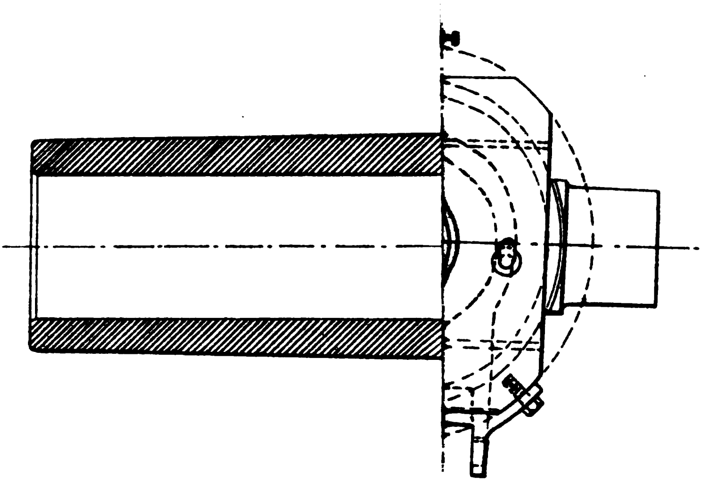


Fig. 36.

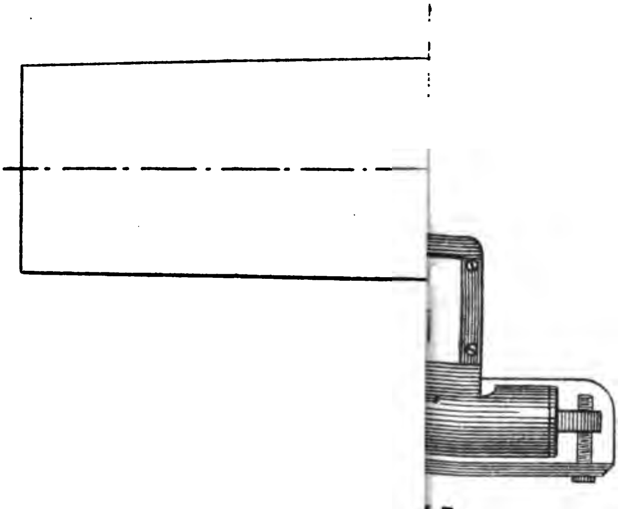
CANET FIELD GUN FOR JAPAN.

London Engineering.



B.

D.



1.

" Rivista."

is 5 degrees 16 minutes, and the final angle is 11 degrees 50 minutes. The mortar, including plug, weighs 3,904 pounds (figs. 37, 38, 39, and 40). To facilitate in pointing, a reflecting quadrant (fig. 41) is provided.

GUN CARRIAGE FOR MOUNTING FIELD GUNS IN FORTIFICATIONS.

This mount for field guns when temporarily used in fortifications was proposed by Colonel Durlacher and adopted by the Russian Government in December, 1895. It has a central pivot and a cone base. The particulars are clearly shown in the drawings (fig. 42). The total weight of the mount, including cone, is 1,698 pounds—the cone weighs 362 pounds. This mount permits a maximum elevation of 10 degrees and depression of 5 degrees.

SPAIN.

R. F. MOUNTAIN GUNS.

The Spanish Government has recently purchased of Krupp a number of mountain guns for use in Cuba. The gun (fig. 43) is of 7.5 centimeters (2.95 inches) caliber and is made of steel. The rifling is progressive. The breech closure is a modified form of the Krupp wedge, and fixed ammunition is used. The plug contains the firing mechanism, which is automatically cocked in turning the lever in opening the breech. The gun is fired by means of a lock string. The empty cartridge case is ejected by an extractor, which is operated by the opening of the breech.

The carriage (figs. 48 and 49) is entirely of steel, with the exception of the wheels, and has these principal parts:—

1. The trail piece, which can be disconnected from the rest of the carriage.
2. The recoil brake, consisting of a claw, or spade, which takes in the ground and bears against a spring in the foot of the trail piece. (Figs. 48 and 49.)
3. The trunnion seats, both in one piece, are separate from the main body of the carriage and turn about a vertical pivot to permit training.

This gun uses three kinds of projectiles: Shell with percussion fuze (fig. 44), shrapnel with combination fuze (fig. 45), and canister (fig. 46).

The cartridges are loaded with 5.85 and 6.7 ounces of W. P. C. 189 smokeless powder, which give, respectively, 900 and 984 foot-seconds initial velocity and 23,354 and 27,422 pounds per square inch mean pressure.

For transportation the gun and carriage are arranged in four packs, the ammunition being taken in separate packs. (Figs. 50, 51, 52, and 53.) A first mule carries the gun, the second the body of the carriage, the third the trail piece and the shafts, the fourth the axle and wheels; each ammunition mule carries two ammunition boxes of six cartridges each (fig. 54).

The following particulars are given:

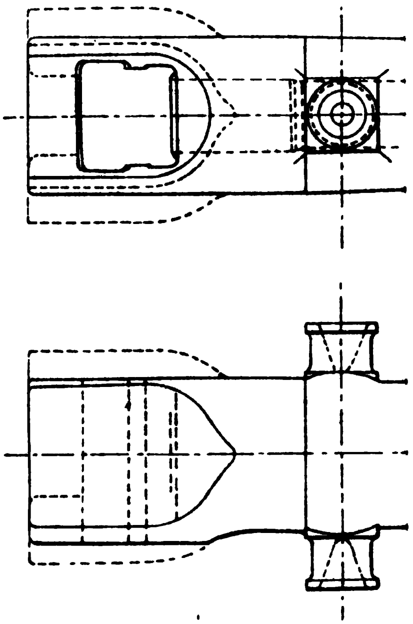
Gun:—			
Caliber		inches	2.95
Total length		do	32.48
		calibers	11
Length of bore		inches	25.8
Depth of rifling		do	.0295
Width of rifling		do	.233
Width of lands		do	.984
Diameter between lands		do	2.95
Initial twist		do	132.9
		calibers	45
Final twist		inches	73.8
		calibers	25
Length between sights		inches	20.7
Capacity of powder chamber		cubic inches	33.56
Capacity of bore		do	178.8
Total weight of gear, including plug		pounds	233.7
Preponderance		do	39.7
Carriage:—			
Weight, including axle and wheels		pounds	621.7
Weight, with gun		do	855.4
Weight of main body		do	242.5
Weight of trail piece		do	172
Weight of axle and fittings		do	57.3
Weight of each wheel		do	75
Weight of shafts		do	41.9
Length of body		inches	38.8
Length of trail		do	46.3
Length of axle		do	42.1
Heigth of axis of trunnions		do	25
Diameter of wheels		do	31.5
Width between wheels		do	32.7
Extreme angle of elevation		degrees	20
Extreme angle of depression		do	10
Ammunition boxes:—			
Length		inches	17.6
Width		do	9.5
Height		do	14.7
Weight, empty		pounds	38.8
Capacity (number of cartridges)			6
Weight of ammunition, per box		pounds	91.9
Total weight		pounds	122.8
Ammunition:—			
Weight of loaded shell or shrapnel with fuze		pounds	13.2
Weight of bursting charge	Shell	ounces	5.4
	Shrapnel	do	3.2
Number of balls in each shrapnel			225
Weight of each ball for shrapnel		ounces	.388
Weight of fuzes	Percussion for shell	ounces	4.4
	Compound for shrapnel	do	16.2
Number of balls in each canister			310
Weight of each ball for canister		ounces	.56
Weight of charge		do	5.85
Weight of cartridge case		do	26.5
Weight of cartridge complete, shell and shrapnel		pounds	15.3
Weight of cartridge complete, canister		do	16.4

Ballistic data:—

Initial velocity .... foot-seconds..	902
Angle of jump .... minutes..	32
Muzzle energy .... foot-tons..	74. 72
Muzzle energy per pound weight of gun and carriage..foot-pounds..	195. 6
Distance corresponding to the maximum of the time fuze ....yards..	3, 900

Range table.

Distance.	Angle of elevation.		Angle of fall.		Remaining velocity.
Meters. Yards.	°	'	°	'	*f. s.*
500 = 547	1	19	2	3	860
1, 000 = 1, 094	3	22	4	19	820
1, 500 = 1, 641	5	39	6	51	784
2, 000 = 2, 188	8	10	9	46	751
2, 500 = 2, 735	10	55	13	2	722
3, 000 = 3, 281	13	56	16	46	695
3, 500 = 3, 828	17	19	21	1	676
3, 900 = 4, 263	20	21	24	49	663



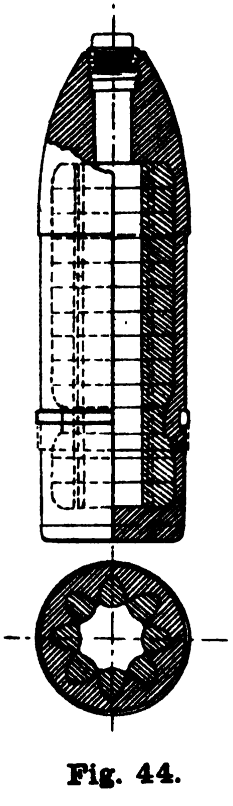
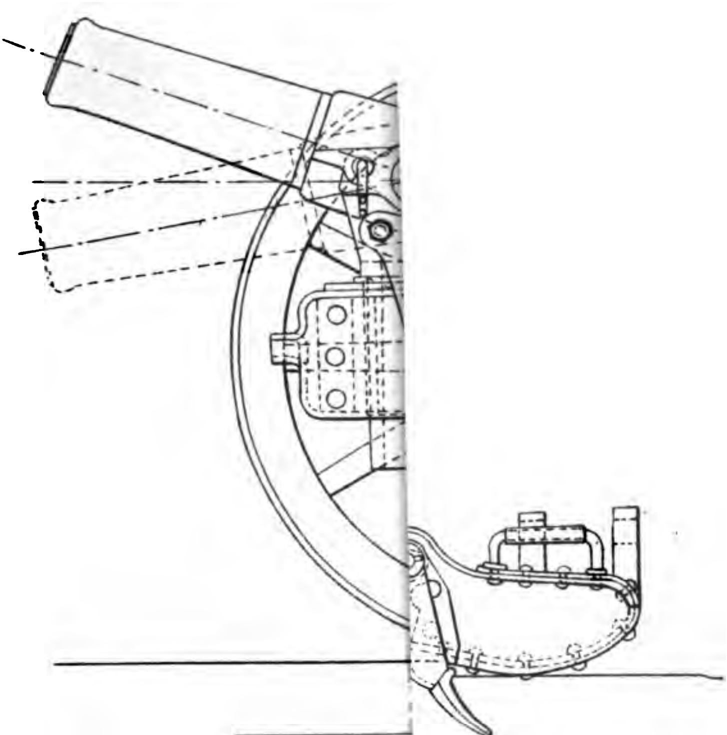
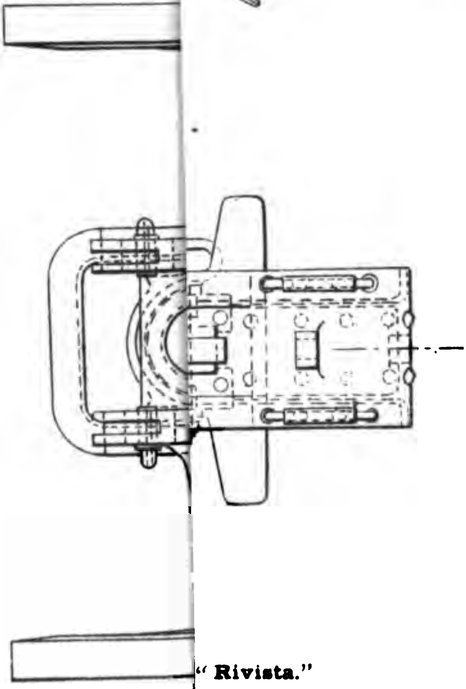


Fig. 44.

SPANISH





“ **Rivista.**”

E.

V.

NOTES ON SMALL ARMS.

By Ensign **Lay H. Everhart**, United States Navy,
Staff Intelligence Officer.

For a number of years there has been much uncertainty as to what was the best caliber for military rifles, and the best authorities have differed widely on this point. Great stress has been laid on the stopping effect, and this has been one of the chief arguments against extremely small calibers, which, it has been claimed, lack in this respect.

However, it has been taken for granted that the future development of small-arm rifles would include a reduction in caliber, which means a reduced weight of ammunition and a flatter trajectory, the limit to this reduction in caliber being controlled by the difficulties of manufacture, of burning enough powder, of getting a barrel to stand the wear, and of getting a bullet that will not strip its envelope.

The latest arm on the European market is the Mannlicher 1896 model of 6-millimeter caliber manufactured by the Austrian small-arms factory. It is thought that a further reduction in caliber will require a bullet of some metal without covering, such as wolfram or tungsten.

The automatic working of the bolt finds advocates for its use in military rifles, not only to increase the rapidity of fire, but to lessen the work done by the rifleman; but it is very questionable whether a rifle of such a nature would be efficient under service conditions.

AUSTRIA.

After many experiments extending over several years and including calibers as small as 4 millimeters, the Austrian small-arms factory has finally decided on what is known as the Mannlicher 1896 model of about 6-millimeter caliber (actually 5.95 millimeters or .2343 inches). The initial velocity of the new arm is 770 meter-seconds (2,526 foot-seconds) and the weight complete 7.7 pounds without the bayonet, which weighs .75 pounds. A marked improvement over other rifles has been made in the greatly reduced proportions of the breech mechanism, which at the same time is said to be stronger and more durable. The bolt is locked into the breech by four studs, thus reducing the chances of accident through imperfections in the metal. The bolt is but .57 inch in diameter and the number of parts have been reduced.

The cartridges are loaded into the magazine in clips of five, and in case some have been fired, individual cartridges may be inserted to fill the magazine. The clips weigh 115.7 grains. The stock completely surrounds the barrel, and an improved attachment for the bayonet is provided.

GREAT BRITAIN.

THE NEW LEE-METFORD BULLET.

The claim that the original Lee-Metford bullet lacks in stopping effect has led to the production of a new bullet, which, it is thought, will be adopted by the British Government. This bullet, which is similar to the Tweedie bullet, is of the same shape as the old one, has its hollow base lined by the jacket, the jacket at the point is made thin, and the lead core is slightly exposed, the lead being filled in from this end, the idea being for the bullet to upset or mushroom on striking an object, and thus increase the size of a wound. The following account of experiments conducted at Dumdum, India, is given in the Broad Arrow:

The experiments consisted in firing at different objects, such as planks in rear of each other, bags of coal, sandbags, tins of dry and moist sand, and wine cases, divided into three compartments filled with earth. One butt was especially devoted to carcasses of sheep. All the objects were fired at with the present bullet and the new bullet, except the sheep, which were only fired at with the new bullet. The result fully justified Colonel Hill's confidence in the new bullet, and the difference in the holes made in the various objects and the amount of mushrooming in each case was very marked. The service bullet was found to have drilled clean holes, and where penetration was complete the hole of exit was little, if any, larger than the hole of entry, and the bullet itself was not deformed, only showing the marks of the rifling, but the exit holes made by the new bullet were much larger; and although the penetration was sufficient, the bullet was either mushroomed or the nickel jacket and lead had parted company. The wounds made in the carcasses of sheep showed that the destruction of bone and tissue perforated by the new bullet was tremendous, and conclusively proved the stopping powers of the bullets.

THE RICCI AUTOMATIC GASTIGHT REVOLVER.

This revolver is rendered gastight by the cartridge case, which extends beyond the bullet, being partly driven forward from the cylinder into the barrel before firing, thus utilizing the powder pressure throughout the length of the barrel.

The operations of loading, extracting the empty case, and cocking the firing pin are performed automatically by the pressure on the face of the plunger at the moment of explosion.

In fig. 1, D is the cylinder; E the plunger; F the firing pin, which is in the center of the plunger; J a two-branch spring, one of which J operates the plunger and the other J′ the striker, and both are employed in resisting the backward pressure at the moment of discharge; L the lever, carrying the pawl T for rotating the cylinder, pivoted at *m;* and the sear M pivoted at *m.* The mechanism for insuring single firing consists of the trigger H hinged at G, carrying a tumbler K hinged at *g*, and gearing at K′ with a shoulder E′ of plunger E. *h* is a spring that operates both the trigger H and tumbler K. R is a spindle made solid with the handle S, which is on the outside of the revolver and serves for locking the sear M, thus preventing accidental discharge. Q is the ordinary pawl for holding the cylinder in place. O is a spindle connected by the handle P, by which the tension of the mainspring J is eased when the revolver is not in use. U is a lever on the outside of the revolver connected with the pivot *m*, which has a projection V gearing with the plunger E, and serves for loading the first turn and working the revolver by hand.

The spindle R is cut just opposite the sear M, so as to allow the latter enough room to work on its pivot *m* when the spindle R is in the position shown and the lever S is upright. When, however, the lever is turned to the position S′, the spindle bears against the sear M, rendering it immovable and thus locking the revolver.

The action of the revolver is as follows: By pulling the trigger the firing pin is released by the sear M through the tumbler K and the cartridge is fired. The powder pressure developed drives the plunger and firing pin backward against the two branches of the spring J at the moment the bullet leaves the muzzle. This movement extracts the empty cartridge case from the barrel, cocks the firing pin in the position shown in fig. 1, and the shoulder E′ of the plunger gearing with the head K′ of the tumbler K puts the latter out of gear with the sear M, which then returns to its normal position, holding the firing pin in the cocked position. As soon as the energy of recoil of the plunger has been absorbed by the spring J, the latter will instantly react, returning the plunger to the front. During this forward movement of the plunger the shoulder *f* of the lever L (which was forced upward during the backward motion of the plunger by the spring *n*) comes in contact with the shoulder *e* of the plunger and causes the lever L to turn downward and rotate the cylinder, by means of pawl T, through one space. The rotation of the cylinder causes the empty cartridge case to slide out of the two extractors of the plunger and a fresh cartridge to be brought opposite the barrel and then thrust in by the plunger, when the revolver will be ready for another shot. It is evident that a round will be fired simply by pulling and releasing the trigger at each shot. The spring J is of such strength that the bullet will have left the muzzle before the empty case is fully extracted from the barrel.

The form of this revolver shown in fig. 2 is so constructed that it may be operated either automatically or by hand. In general, it is like that illustrated by fig. 1, with the difference that the recoil is taken up by one flat spring and one spiral spring, the latter taking up the recoil through a system of two links and a thrust piece.

N is the thrust piece pivoted at q and takes the recoil through the plunger. The upper link O is hinged at N^2 to the thrust piece and at P' to the lower link P, the latter being pivoted at P^2. The spring X is connected to the lower link by the pin X'. P^3 is a projection on the link P bearing against the slide V and keeping the center P' below the line N^2P^2 when working automatically, so that the recoil of the plunger is taken by the spring X. When, however, the lever U is rotated to the position shown by the dotted lines, the slide V is withdrawn and the projection P^3 will bear against the frame of the pistol bringing the center P' above the line P^2N^2 so that there will be no recoil of the plunger, the thrust being taken by P^2. The plunger will therefore have to be withdrawn by hand by the tailpiece O'. The action of this revolver can now be clearly seen.

The cartridge cases used for this revolver are grooved (fig. 3) and slightly conical, with the case prolonged to the extremity of the bullet, and have thick walls to prevent explosion.

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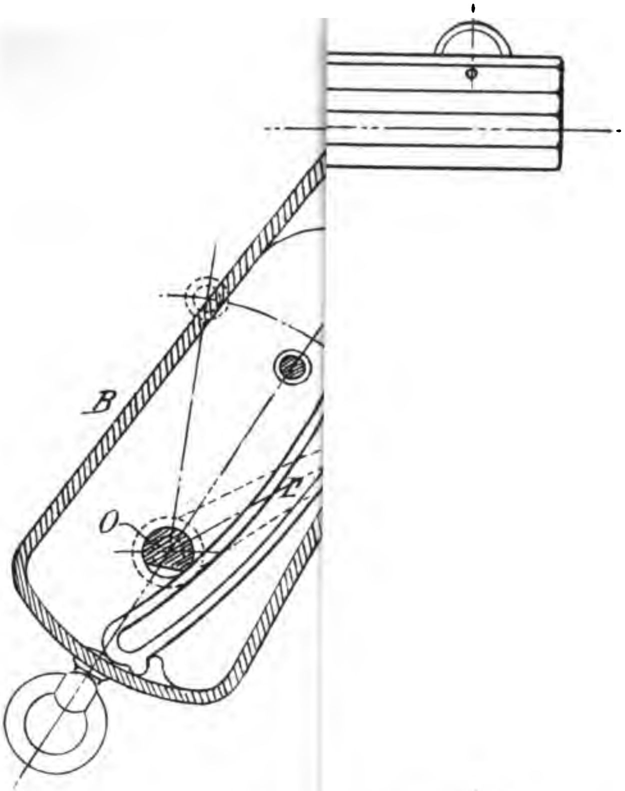
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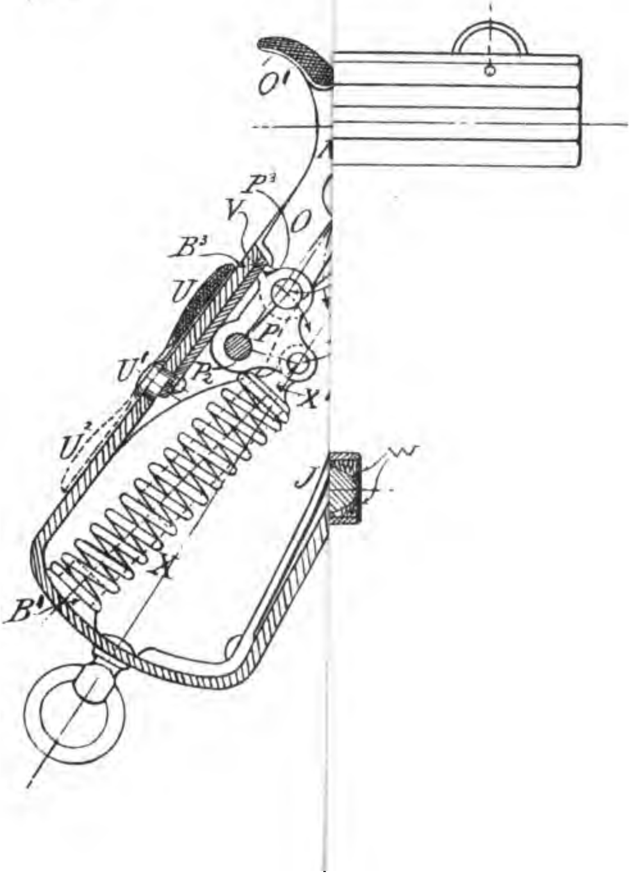
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OFFICE OF NAVAL INTELLIGENCE,

PART III: GENERAL INFORMATION SERIES, No. XVI.

INFORMATION FROM ABROAD.

NOTES

ON

NAVAL PROGRESS.

JULY, 1897.

NAVY DEPARTMENT,
OFFICE OF NAVAL INTELLIGENCE.

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VI.

NAVAL MANŒUVRES OF 1896.

By Lieut. Commander E. B. **Barry**, United States Navy,
Staff Intelligence Officer.

THE BRITISH MANŒUVRES.

According to the newspapers, the information "leaked out" that the date fixed for the mobilization was July 15. Early in June orders were given to get ready at Devenport by the end of the month, for *Tactical Exercises*, 16 vessels, comprising 2 battleships, 4 cruisers, 2 special-service vessels, and 8 torpedo vessels. Of these, 8 did not take part in the manœuvres. June 20, however, an official announcement was made fixing July 8 as the day on which the ships selected by the Admiralty would be commissioned for tactical exercises. Later, by order, the word *Manœuvres* was substituted for *Tactical Exercises* in the Admiralty order of June 20. June 24 the Channel Squadron was due to arrive at Portland, where the vessels were to fill up with coal and with sufficient stores to last until the end of July. June 25 official instructions were issued designating the vessels to be specially commissioned; also the guard ships and other vessels to have their complements filled to seagoing strength.

Number and class of vessels taking part in the manœuvres.

Station.	Battle-ships.	Cruisers.	Gun and torpedo vessels.	Torpedo boats.	Total.
I.—*Vessels commissioned for the manœuvres.*					
1. Chatham	....	7	3	6	16
2. Devonport	....	4	4	6	13
3. Portsmouth	1	6	2	12	21
Total	1	17	9	24	51
II.—*Coast and port-guard vessels, complements filled.*					
1. Chatham	1	2	8	....	11
2. Devonport	5	1	9	....	15
3. Portsmouth	2	1	8	....	11
Total	8	4	25	....	37
III.—*Channel Squadron.*					
English Channel, etc	6	4	7	....	17
Grand total	15	25	41	24	105

Table showing strength of manœuvre fleets for years 1894, 1895, 1896.

	Battle-ships.	Cruisers.	Gun and torpedo vessels.	Torpedo boats.	Total.
I.—*Vessels specially commissioned.*					
1894	1	23	11	23	58
1895	....	19	9	12	40
1896	1	17	9	24	51
II.—*Vessels already in commission.*					
1894	8	7	12	1	28
1895	5	4	13	....	22
1896	8	4	25	....	37
III.—*Channel Squadron.*					
1894	4	2	3	....	9
1895	4	2	3	....	9
1896	6	5	8	....	*a* 19

a One cruiser and 1 torpedo vessel did not take part in the manœuvres.

Except coal passers, no scarcity of men to fill complements was expected. The men returning from the Australian station had their leave stopped until after the manœuvres. July 2 the following orders and instructions were issued by the Admiralty:

1. The partial mobilization of the fleet this year will take place in July. The ships mobilized will be attached to the Channel and Reserve squadrons for the usual exercises during the preliminary cruise, after which the admirals, acting under the orders received by them, will distribute the ships for the manœuvres which form the second part of the exercises.

2. The ships and vessels assigned to the Channel Squadron for the preliminary exercises will assemble at Portland. Those in a similar way assigned to the Reserve Squadron will assemble at Plymouth.

3. When in all respects ready the Channel and Reserve fleets will proceed to sea for the usual preliminary cruise, during which the fleets may be anchored and exercised at the discretion of the admirals in command.

4. During the absence of the two fleets the torpedo-boat flotilla will be separately exercised from Milford Haven as headquarters.

5. At the expiration of the preliminary cruise the ships and vessels of the fleets will proceed to the ports indicated in the secret orders to coal and prepare for the manœuvres.

6. Instructions for the guidance of the admirals and other officers in command, previous to and during the manœuvres, have been issued, which will come into force at a date to be hereafter specified.

7. The general character of the operations to be carried out in this year's manœuvres is the watching of one fleet in port by the cruisers of another fleet lying in readiness at a chosen anchorage, so that no opportunity may be lost of bringing the first fleet to action or of ultimately defeating the object it has in view before the expiration of the five days allowed for the exercise.

8. The forces placed at the disposal of the admirals in chief command of the opposing fleets will therefore have to be combined and utilized by them in such a manner as to secure the accomplishment of the task alloted to each. No general idea of the manœuvres will be issued beforehand, but the conditions, relative to the fleets,

which exist before the actual commencement of the exercise will be made known to each admiral separately, so that the measures they adopt and the dispositions they make will depend upon this knowledge and the subsequent information they acquire from their own ships and signal stations.

9. The superiority of either of two fleets which meet will, if they are complete and intact in battleships, be decided by the rules to be issued; but if not intact, it will depend on the superior number of battleships present in one fleet. All battleships will count alike for this purpose, and cruisers will not affect the issue.

10. On the conclusion of the manœuvres the ships and vessels will proceed to carry out target practice, separately in the case of all mobilized ships, ample time being allowed for the careful performance of the practice. In the case of other ships, separately or in squadron, at the discretion of the admiral in command.

11. Only one-half of one-quarter's allowance of ammunition is to be expended from the heavy, light, machine, and quick-firing guns of the mobilized ships, and this proportion is to be fired only on the day appointed for target practice, when the guns' crews have become accustomed to their work and can benefit most by the practice.

12. Torpedo-boat destroyers will carry their gun armament, and no alternative armaments will be taken for torpedo boats.

13. As regards depot stores, no ordnance or torpedo stores are required, and only such naval stores as are necessary to keep the destroyers and torpedo boats efficient during the time of the manœuvres. Such naval stores will be embarked in the depot vessels before leaving their ports. The above does not apply to the destroyers already in commission as tenders.

14. A full quarter's ammunition may be fired from destroyers and torpedo boats if considered desirable by the officers commanding fleets. If it is desired to exceed that allowance, Admiralty permission must be obtained at the time.

15. A copy of the ship's log and signal log of every ship taking part in the manœuvres, commencing twelve hours before and ending twelve hours after the active operations, is to be sent to the Admiralty with the reports of the admirals in chief command.

The fleets which will assemble at Portland and Plymouth, respectively, are:

Channel fleet.

Majestic (flag).
Magnificent (flag).
Royal Sovereign.
Empress of India.
Repulse.
Resolution.
Blenheim.
Hermione.
Charybdis.
Naiad.
Sirius.
Apollo.
Thetis.
Tribune.
Forth.
Severn.
Latona.
Andromache.
Melpomene.
Bellona.
Speedy.
Harrier.
Hussar.
Spanker.
Halcyon.
Alarm.
Antelope.
Hazard.
Decoy.
Handy.
Lightning.
Salmon.
Sunfish.
Dragon.
Janus.
Boxer.
Bruiser.
Daring.
Hart.
Opossum.
Snapper.
Ferret.
Contest.
Lynx.
Banshee.
Havock.
Hasty.
Porcupine.

RESERVE FLEET.

ALEXANDRA (flag).
SANSPAREIL (flag).
BENBOW.
EDINBURGH.
COLOSSUS.
SULTAN.
DREADNOUGHT.
THUNDERER.
DEVASTATION.
AUSTRALIA.
GALATEA.
IRIS.
MERSEY.
PHAETON.
MELAMPUS.
IPHIGENIA.
TERPSICHORE.
INDEFATIGABLE.
BRILLIANT.
PEARL.
LEDA.
NIGER.
ONYX.
RENARD.
CIRCE.
JASON.
SHARPSHOOTER.
SHELDRAKE.
JASEUR.
LANDRAIL.
SPIDER.
CURLEW.
SEAGULL.

Torpedo Boats.

No. 95
68
94
67
No. 87
66
85
64
No. 84
65
81
60
No. 79
58
77
59
No. 76
52
73
57
No. 74
50
71
55

Complete preparations were made for the mobilization at the three ports. July 8 the partial mobilization took place. At Devonport, although the hour set was 9 a. m., the crews were sent aboard at 6.30 a. m. and the officers at 7.30 a. m.

The total number of men engaged in the manœuvres was 20,078: Officers, 841; petty officers and seamen, 7,812; boys, 1,028; marines, 2,210; engine room force, 785; firemen and coal passers, 4,914; miscellaneous ratings, 2,488.

After the complements had been supplied there were 2,620 men left at the Portsmouth depot. At Chatham there were 658 men still in the training classes at the gunnery school. July 11 the weekly victualing return at Portsmouth showed 5,600 officers and men still in the fleet. There were 28 officers and about 500 men of the Royal Naval Reserve employed.

The conditions of service for Royal Naval Reserve men during the manœuvres, issued by the Admiralty, were as follows:

> The pay as noncontinuous first-class able seamen will be 1s. 4d. ($0.32) per day; as noncontinuous service second-class ordinary seamen, 1s. 1d. ($0.26) per day; for firemen, as noncontinuous service stokers, 1s. 9d. ($0.42) per day. Trained men to receive 1d. ($0.02) a day extra, and men employed coaling the ships to receive extra pay. If sent to hospital or sick quarters, pay is to be allowed under the same conditions as to noncontinuous service seamen of the fleet. Pay will commence from the date of embarkation, and free rations will be granted. Every man will be credited with £1 10s. ($7.30) in lieu of clothing, which is sufficient to replace articles damaged or lost after paying for articles purchased or taken up aboard to complete the necessary kit. A gratuity of £1 ($4.86) is to be paid on discharge after twenty-eight days' service. Traveling expenses will be paid to the men or passes issued to the ships and back to their homes, also allowances to cover subsistence and lodging under article 1522 of the Queen's Regulations when meals are not provided at the public expense in traveling by land and water at the following rates: Whenever absent a night, or for every twenty-four hours' absence, 5s. ($1.21);

above nine hours, and not absent a night, 2s. 6d. ($0.61). Marked bedding will be lent the men gratuitously. Men will be discharged to their homes after being twenty-eight days aboard. Time serve aboard during the naval manœuvres is to in addition to the year's drill, or, at the option of the men, to count as the year's drill, or as drill in arrear or advance. Men embarked for the naval manœuvres will be allowed to volunteer at the expiration of the twenty-eight days for six months' further service in the fleet.

Two hundred officers and men of the Irish Coast Guard from Dublin joined the fleet.

Arrangements at Devonport were so complete that the times of departure for the different vessels were set. Most of the preparations were made before the time set for the mobilization.

After adjusting compasses and undergoing one hour's full power natural draught trial the vessels left for their first places of assembly.

There were no depot ships for the torpedo vessels; they were to draw whatever stores required from the ships they accompanied.

The SEAGULL, SPIDER, LANDRAIL, and CURLEW were detailed as depot ships for the torpedo boat flotilla.

At Chatham the following-named vessels were placed in commission: Cruisers: TERPSICHORE, *Tribune*, *Apollo*, *Andromache*, *Thetis*, *Severn*, BRILLIANT. Torpedo vessels: *Porcupine*, *Alarm*, JASEUR. Torpedo boats: **Nos. 64, 65, 66, 67, 68, 73, 74.**

At Devonport: Cruisers: *Forth*, *Sirius*, PEARL, PHÆTON. Torpedo vessels: *Antelope*, *Hazard*, *Harrier*, *Hussar*. Torpedo boats: **Nos. 52, 55, 57, 58, 85, 87.**

At Portsmouth: Battleship, SULTAN. Cruisers: IPHIGENIA, INDEFATIGABLE, *Melpomene*, *Latona*, IRIS, *Naiad*. Torpedo boats: *Havock*, *Hasty*, and torpedo boats **Nos. 50, 59, 60, 71, 76, 77, 79, 83, 84, 94, 95.**

The following named vessels already in commission had their complements filled:

At Chatham: Battleship: SANS PAREIL. Cruisers: GALATEA, MERSEY. Gun vessel: LANDRAIL. Torpedo vessels: ONYX, CIRCE, SHELDRAKE, and torpedo boats *Janus*, *Contest*, *Dragon*, *Snapper*.

At Devonport: Battleships: BENBOW, COLOSSUS, DEVASTATION, DREADNOUGHT, THUNDERER. Cruiser: MELAMPUS. Gun vessel: CURLEW. Torpedo vessels: *Banshee*, JASON, RENARD, SHARPSHOOTER, SPIDER. Torpedo boats: *Lynx*, *Ferret*, *Opossum*.

At Portsmouth: Battleships: ALEXANDRA, EDINBURGH. Cruiser: AUSTRALIA. Torpedo vessels: Niger, LEDA, *Spanker*, SEAGULL. Torpedo boats: *Boxer*, *Bruiser*, *Daring*, *Hart*.

The following-named vessels of the channel squadron took part in the manœuvres:

Battleships: *Magnificent*, *Majestic*, *Royal Sovereign*, *Resolution*, *Repulse*, *Empress of India*. Cruisers: *Blenheim*, *Hermione*, *Charybdis*, *Bellona*. Torpedo vessels: *Halcyon*, *Speedy*. Torpedo boats: *Decoy*, *Handy*, *Lightning*, *Salmon*, *Sunfish*.

The mobilization was carried out within forty-eight hours from the time of hoisting the pennants.

The following is the composition of the fleets:

COMPOSITION OF THE FLEETS.

Channel Fleet.

Vice-Admiral Lord Walter T. Kerr, K. C. B., commanding *Channel Fleet,* and later in immediate command of *A Squadron;* Rear-Admiral Armand T. Powlett, second in command, and later in immediate command of *B Squadron.*

A Squadron.

First place of assembly, Portland; second place of assembly, Bantry Bay.

Ship.	Class.	Former station.	Date of completion.	Displacement.	Guns, main battery.	Maximum speed.	Complement.
				Tons.		*Knots.*	
Majestic (flag)	Battleship	Channel	1895	14,900	16	17.5	757
Empress of India	do	do	1893	14,150	14	18	725
Royal Sovereign	do	do	1892	14,150	14	18	730
Repulse	do	do	1894	14,150	14	17.5	730
Resolution	do	do	1893	14,150	14	17.9	725
Apollo	Protected cruiser, second class.	Chatham	1892	3,400	8	20	273
Naiad	do	Portsmouth	1891	3,400	8	20	273
Forth	do	Devonport	1888	4,050	8	17.2	325
Severn	do	Chatham	1887	4,050	8	17.3	325
Sirius	do	Devonport	1892	3,600	8	20	273
Thetis	do	Chatham	1892	3,400	8	20	273
Tribune	do	do	1892	3,400	8	20	273
Harrier	Torpedo vessel	Devonport	1895	1,070	2	18.5	115
Hussar	do	do	1895	1,070	2	18.5	115
Spanker	do	do	1891	735	2	19	91
Speedy	do	Channel	1894	810	2	20.2	91
Decoy	Torpedo boat, first class.	do	1894	220	4	27.6	45
Dragon	do	Instructional flotilla, Chatham.	1895	265	4	27.1	50
Boxer	do	Instructional flotilla, Portsmouth.	1894	250	4	29.1	45
Bruiser	do	do	1895	250	4	27.9	45
Daring	do	do	1893	220	4	28.6	50
Handy	do	Channel	1895	260	6	27.8	50
Lightning	do	do	1895	277	6	27.9	50
Janus	do	Chatham	1895	277	6	27.8	50
Salmon	do	Channel	1895	264	6	27.7	50
Sunfish	do	do	1895	264	6	27.2	50

B Squadron.

Second place of assembly, Kingstown.

Ship.	Class.	Former station.	Date of completion.	Displacement.	Guns, main battery.	Maximum speed.	Complement.
				Tons.		*Knots.*	
Magnificent	Battleship	Channel	1895	14,900	16	17.5	757
Blenheim (*a*)	Armored cruiser	do	1893	9,000	12	21.6	563
Charybdis (*a*)	Protected cruiser, first class.	do	1894	4,360	10	20	318
Hermione (*a*)	do	do	1894	4,360	10	20	318
Andromache	Protected cruiser, second class.	Chatham	1891	3,400	8	20	273
Bellona	do	Channel	1894	1,830	6	17	160
Latona	do	Portsmouth	1891	3,400	8	20	273
Melpomene (*b*)	do	do	1889	2,950	6	19	216
Alarm	Torpedo vessel	Chatham	1894	810	2	19.6	93
Antelope	do	Devonport	1894	810	2	19.2	91
Halcyon	do	Channel	1894	1,070	2	18.5	115
Hazard	do	Devonport	1894	1,070	2	19	115
Contest	Torpedo boat, first class.	Instructional flotilla, Chatham.	1894	265	1	27.4	50
Hart	do	Instructional flotilla, Portsmouth.	1894	300	6	27.1	50
Hasty	do	Portsmouth	1894	220	6	27	50
Opossum	do	Devonport	1896	264	6	28.2	50
Havock	do	Portsmouth	1893	215	4	26.7	43
Banshee	do	Instructional flotilla, Devonport.	1895	265	6	27.9	50
Ferret	do	do	1893	220	4	27.6	50
Lynx	do	do	1894	220	4	27.3	50
Porcupine	do	Chatham	1895	277	6	27	50
Snapper	do	Instructional flotilla, Chatham.	1895	264	6	27	50
Hunter (*c*)	do	Portsmouth	1896	265	6	27	50

a Rated as battleships for manœuvre purposes.

b Took the place of *Blake*, repairing.

c Replaced *Opossum*.

Reserve Fleet.

Vice-Admiral Edward H. Seymour, C. B., commanding Reserve Fleet, and later in immediate command of C Squadron; Rear-Admiral Arthur K. Wilson, C. B., V. C., second in command and later in immediate command of D Squadron.

C Squadron.

First place of assembly, Plymouth; second place of assembly, Milford Haven.

Ship.	Class.	Former station.	Date of completion.	Displacement.	Guns, main battery.	Maximum speed.	Complement.
				Tons.		*Knots.*	
Alexandra (flag)	Battleship	Coastguard, Portland	1877	9,490	18	14.3	674
Edinburgh	do	Coast guard, Queensferry.	1886	9,420	9	14.2	396
Colossus	do	Coastguard, Holyhead	1886	9,420	9	14.2	396
Sultan	do	Portsmouth	*a*1895	9,290	12	15	396
Benbow	do	Coast guard, Greenwich.	1888	10,630	12	16.7	503
Australia	Armored cruiser	Coast guard, Southampton.	1888	5,600	12	18.1	497
Terpsichore	Protected cruiser, second class.	Chatham	1892	3,400	8	20	273
Galatea	Armored cruiser	Coast guard, Hull	1888	5,600	12	18.1	497
Iris	Cruiser, second class.	Portsmouth	1879	3,730	13	17	257
Mersey	Protected cruiser, first class.	Coast guard, Harwich.	1887	4,050	12	17.3	327
Iphigenia	Protected cruiser, second class.	Portsmouth	1892	3,600	8	19.7	273
Phaeton	do	Devonport	1883	4,300	10	17	297
Leda	Torpedo vessel	Southampton, tender	1894	810	2	19.2	91
Onyx	do	Tender, Harwich	1894	810	2	19.2	91
Renard	do		1894	810	2	19.2	91
Niger	do	Queensferry, tender	1894	810	2	19.3	91
Circe	do	Tender, Harwich	1894	810	2	19.2	91
Spider	do	Devonport	1891	525	1	19	61
Landrail	Partly protected gun vessel.	Tender to Wildfire, refitting Chatham.	1886	950	4	11.5	103
Skate	Torpedo boat, first class.	Held in reserve	1895	240	6	27	56

a Rebuilt.

D SQUADRON.

Second place of assembly, Torbay.

Ship.	Class.	Former station.	Date of completion.	Displacement.	Guns main battery.	Maximum speed.	Complement.
				Tons.		*Knots.*	
SANSPAREIL (flag)	Battleship	Port guard, Sheerness.	1887	10,740	15	17.5	630
DEVASTATION	do	Port guard, Devonport.	*a*1892	9,330	4	14	420
THUNDERER	do	Port guard, Pembroke.	*a*1890	9,330	4	14.2	420
DREADNOUGHT	do	Coast guard, Bantry	1875	10,820	10	13.6	440
MELAMPUS	Protected cruiser, second class.	Coast guard, Kingstown.	1892	3,400	8	20	273
INDEFATIGABLE	do	Portsmouth	1892	3,600	8	19.7	273
BRILLIANT	do	Chatham	1893	3,600	8	19.7	325
PEARL	do	Devonport	1892	2,575	8	19	227
SHARPSHOOTER	Torpedo vessel	Particular service	1890	735	2	19	91
SHELDRAKE	do	Chatham	1890	735	2	20	91
JASEUR	do	do	1894	810	2	19.2	91
JASON	do	Particular service	1894	810	2	19.2	91
CURLEW	Partly protected gun vessel.	do	1885	950	4	14.5	103
SEAGULL	Torpedo vessel	Tender	1891	735	2	19	91

a Rebuilt.

Torpedo Boat Flotilla.

First place of assembly, Plymouth.

With C SQUADRON.

Second place of assembly, Milford Haven.

Boat.	Class.	Former station.	Date of completion.	Displacement.	Tubes	Maximum speed.	Complement.
				Tons.		*Knots.*	
No. 95, divisional	Torpedo boat	Portsmouth	1894	130	3	23.5	18
No. 58	do	Devonport	1886	60	4	21	15
No. 65	do	Chatham	1886	75	5	19.20	15
No. 74	do	do	1886	75	5	19.20	15
No. 76	do	Portsmouth	1886	75	5	19.20	15
No. 87, divisional	do	Devonport	1889	85	3	23	19
No. 84, divisional	do	Portsmouth	1889	85	3	23	19
No. 50	do	do	1886	60	1	21	15
No. 52	do	Devonport	1886	60	5	19.20	15
No. 66	do	Portsmouth	1886	75	5	19.20	15
No. 68	do	Chatham	1886	75	5	19.20	15
No. 79	do	Portsmouth	1886	75	1	22.24	15

With D SQUADRON.

Second place of assembly Torbay.

Boat.	Class.	Former station.	Date of completion.	Displacement.	Tubes	Maximum speed.	Complement.
				Tons.		*Knots.*	
No. 85, divisional	Torpedo boat	Devonport	1889	85	3	23	19
No. 55	do	do	1886	60	4	21	15
No. 57	do	do	1886	60	4	21	15
No. 67	do	Chatham	1886	75	5	19.20	15
No. 71	do	Portsmouth	1886	75	5	19.20	15
No. 81, (*a*) divisional	do	do	1885	125	3	20.8	23
No. 49, (*b*) divisional	do	do	1886	60	4	21	15
No. 60 (*c*)	do	do	1886	60	4	21	15
No. 59	do	do	1886	60	4	21	15
No. 64	do	Chatham	1886	75	5	19.20	16
No. 73	do	do	1886	75	5	19.20	15
No. 77	do	Portsmouth	1886	75	5	22.4	15

a Replaced No. 83. *b* Replaced No. 94. *c* Replaced by No. 27.

The SEAGULL and SPIDER were detailed to act as depot vessels for the Portsmouth flotilla, the LANDRAIL for Sheerness, and the CURLEW for Devonport.

The mobilization may be said to have been carried out within forty-eight hours from the time of commissioning.

The SPIDER was the first vessel to leave Devonport, proceeding direct to Portsmouth to take aboard stores. The CURLEW and DEVASTATION followed, taking up their allotted moorings.

The torpedo boats were the first to leave Chatham, followed by the JASON and *Porcupine.* July 9 the TERPSICHORE was the first to leave.

From Portsmouth the *Havock*, *Hasty*, *Sunfish*, and *Handy* left July 8 for their rendezvous. Of the larger vessels the IRIS was the first to leave. All the vessels except the SULTAN and LATONA completed their steam trial July 8.

Torpedo boat No. 77 steamed into harbor at 11 a. m., quickly followed by Nos. 81 and 79. The *Havock* and *Hasty* got away about noon.

PORTLAND.

July 10, of the *Channel Fleet* proper, all ships designated to take part in the manœuvres, except the *Blenheim*, had reached Portland. Except the *Hunter*, all the Portsmouth detail had arrived, and all the Devonport detail except the *Forth.* From Chatham only the *Tribune*, *Alarm*, *Porcupine*, *Snapper*, and *Contest* had arrived. Late that night the *Apollo*, *Thetis*, *Severn*, *Andromache*, and *Janus* anchored in the harbor. July 12, with the exception of the *Blenheim*, the *Channel Fleet* was complete.

PLYMOUTH SOUND.

The first vessel of the RESERVE FLEET to arrive was the battleship THUNDERER, July 6, followed July 8 by the DEVASTATION and CURLEW. The flagship ALEXANDRA arrived July 9. July 10 the CURLEW left for Milford Haven, convoying torpedo boats **Nos. 52, 55, 57, 58, 85,** and **87**. July 11 the SEAGULL convoyed torpedo boats **Nos. 76, 50, 71, 77, 81,** and **95** to Milford Haven, as also the SPIDER **Nos. 49, 60, 64, 66, 79,** and **84**. Off Eddystone Light, however, the SPIDER, owing to a leak in the main steam pipe, put back to Devonport. July 12 the fleet was complete except the LANDRAIL, injured in collision. The PHAETON was ordered to take her place, and left, as depot ship, for Milford Haven July 13, at 1 p. m. Her repairs completed, the SPIDER convoyed to Milford Haven torpedo boats **Nos. 59, 65, 67, 68, 73,** and **74**.

The comparative strength of the two fleets as assembled was as follows:

Fleet.	Battle-ships.	Cruisers.	Torpedo vessels.	Torpedo boats.	Total.
Channel	6	14	8	20	48
RESERVE	9	11	13	24	57

Total number of men in—

Channel Fleet	10, 247
RESERVE FLEET	9, 831

Of the Royal Naval Reserve, 633 men volunteered for service in the manœuvres, 216 first-class and 417 second-class men. Of these 537 took part in addition to 28 officers.

It might be of interest to notice here that the battleship SULTAN was sunk near Malta in the Comino Channel some years ago and afterwards raised. She was virtually rebuilt, given military masts with fighting tops instead of being ship rigged, and her battery improved by the addition of R. F. guns. In spite of the £200,000 ($973,300) spent on her, opinions differ as to her efficiency. Her main battery still is composed of M. L. R.

The Channel Fleet.

Heavy fog detained the fleet from 9.30 a. m., the hour fixed for weighing, until 5.15 p. m., when the weather cleared.

The torpedo vessels and torpedo boats left first, cruisers next, and battleships last.

The fleet was organized into a number of divisions, as follows:

Battleships, first division: *Majestic* (1), *Royal Sovereign* (3), *Repulse* (5). Second division: *Magnificent* (2), *Empress of India* (4), *Resolution* (6). The numbers refer to the torpedo-boat division attached to the vessel.

Cruisers and torpedo vessels: First division, *Apollo*, *Tribune*, *Forth*; second division, *Charybdis*, *Naiad*, *Sirius*; third division, *Hermione* (7), *Latona*, *Andromache;* fourth division, *Thetis*, *Serern*, *Melpomene;* fifth division, *Halcyon*, *Hussar*, *Spanker;* sixth division, *Bellona*, *Harrier*, *Antelope;* seventh division, *Speedy*, *Hazard*, *Alarm.*

Torpedo boats: First division, *Lightning*, *Sunfish*, *Hunter;* second division, *Decoy*, *Salmon*, *Handy;* third division, *Dragon*, *Janus*, *Snapper;* fourth division, *Banshee*, *Havock*, *Ferret;* fifth division, *Lynx*, *Hart*, *Hasty;* sixth division, *Boxer*, *Bruiser*, *Daring;* seventh division, *Contest*, *Porcupine.*

July 14, the first, third, and sixth torpedo-boat divisions went to Falmouth to coal, in compliance with an order requiring them to report whenever the full working stowage, 60 tons, is reduced 25 tons. The other torpedo-boat divisions were sent the following morning. Although the speed of the fleet had not exceeded 10 knots, these little vessels needed a further coal supply after twenty-four hours, though three-fourths boiler power had not been exceeded.

July 15, the following times were required by the battleships to clear ship for action: *Repulse*, 7 minutes 58 seconds; *Resolution*, 9 minutes 5 seconds; *Magnificent*, 9 minutes 30 seconds; *Majestic*, 13 minutes 55 seconds; *Royal Sovereign*, 14 minutes 30 seconds; *Empress of India*, 16 minutes 10 seconds.

July 15, during the evening, the *Blenheim* joined the fleet, which had anchored at 3 p. m. in Mounts Bay.

The cruisers of each division were distinguished from one another by an arrangement of balls, rings, or stripes painted on the smoke pipe. One band on the forward smoke pipe designated the first division; two bands, the second division; similarly the after smoke pipe designated the third and fourth divisions. A ball on each side of the forward smoke pipe, the fifth division, etc. The torpedo boats had painted on their bows, in white figures 2 feet long, the number of their division.

July 16, the fleet got under way at 4 p. m. and steamed to the southward. At 7 p. m. course was altered to the westward and the composition of the squadrons *A* and *B* was made known. July 17, at noon, the squadrons parted company.

A Squadron.

July 18, exercise at general quarters, fire quarters, etc., and at night the squadron steamed with all lights masked. July 19 the squadron anchored in Bantry Bay, Bearhaven, at 11 a. m. While entering the harbor a man fell overboard from the *Resolution.* He was picked up by a boat from the *Boxer* and turned over to the *Resolution's* cutter. In retaking her station in column the *Resolution* scraped along the starboard side of the *Repulse*, her next astern, and her port side was swept clean, including boats and boat davits, which were rigged out. Neither vessel suffered material damage in the hull.

Coaling by the battleships was completed July 21 and by the cruisers July 22.

B Squadron.

July 18 was spent in exercises similar to those of the *A Squadron.* In the afternoon the squadron anchored in Falmouth Harbor, where colliers were awaiting the vessels. The smaller vessels coaled at once and finished before night. July 20, the larger vessels filled up with coal. July 23, the squadron got under way at 5.30 p. m. and shaped course for Kingstown. Night quarters and other exercises were held during the passage, and the squadron anchored at Kingstown July 24 at 3.30 p. m. All the smaller vessels filled up with coal.

The twenty torpedo boats were stationed along the southeast coast of Ireland to watch the RESERVE torpedo boats and to protect *A* and *B* while in the Irish Channel. "The efficiency of this service is of great importance to *Squadron B*, which will be the most exposed to this nature of attack."[1]

The *Channel Fleet* was now ready and awaiting the "declaration of war."

EXTRACTS FROM FIRST INSTRUCTIONS.

To Admiral of *A Squadron.*

The cruisers of your squadron may go out on receipt of a telegram "Prepare for hostilities," but no hostile act is to be permitted until after war has been declared.

The commencement of hostilities, equivalent to a declaration of war, is expected on the 24th of July. On that day C SQUADRON will be at Milford Haven watched by your cruisers.

Your primary object should be to defeat C SQUADRON by "meeting" it at sea before it can be reenforced; failing that, to defeat the reinforcing squadron or prevent its junction, and failing either [both?], to prevent the entry of the hostile fleets into Lough Swilly.

The objects to be attained are given in the order of their importance, and it can be understood that no other success can make up for leaving C SQUADRON intact.

To Admiral of *B Squadron.*

On receipt of the telegram "Prepare for hostilities," which may be expected early on the 24th of July, you are to proceed at once with your squadron to Dublin Bay, and on your arrival place yourself under the command of the vice-admiral of *A Squadron.*

RESERVE FLEET.

July 10 and 11 the ships filled up with coal. July 13, at 2.35 p. m., the RESERVE FLEET got under way.

As it left the harbor the fleet was formed into two divisions, as follows:

First division: ALEXANDRA, GALATEA, DEVASTATION, EDINBURGH, MELAMPUS, BENBOW. First scouts: MERSEY, IRIS, SHELDRAKE. First lookout: BRILLIANT. First linking ships: SHARPSHOOTER, RENARD. Third linking ship: NIGER.

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[1] From Admiralty report, 1897.

Second division: SANSPAREIL, AUSTRALIA, DREADNOUGHT, COLOSSUS, SULTAN, THUNDERER. Second scouts: IPHIGENIA, PEARL, ONYX. Second lookouts: TERPSICHORE, JASEUR. Second linking ships: LEDA, CIRCE. Fourth linking ship: JASON.

Distance between vessels, 2 cables. The fleet exercised at squadron evolutions fog drill, towing fog buoys, signaling with guns and whistles, collision, and grounding stations. Every effort was made to get the ships and crews as rapidly as possible into a state of efficiency.

Before going to sea the following order was issued by Vice-Admiral Seymour:

> Each ship is to fit as fog buoys two 18-gallon casks, painted red, with two broad white stripes and fitted with slings. These are to be used as buoys, to be towed astern in case of fog.

July 14, the INDEFATIGABLE, that had remained at anchor to remedy defects in her machinery, rejoined during the evening. She was detailed as a "First lookout."

The usual scouting exercises were practiced.

July 15, at 3.30 p. m., the fleet anchored in Falmouth Bay.

July 16, got under way at 10.45 a m. The evolution was smartly performed, and contrasted with the first weighing from Plymouth. The fleet steamed out in reverse order, the vessels nearest inshore taking the heads of the columns.

When clear of the bay the signal was made to take the third organization. This arrangement had not been made public before. The organization of the C and D squadrons shows it. (*See* Composition of the Fleets, pp. 11, 12).

One of Vice-Admiral Seymour's orders directed that "all ships are to leave their final coaling ports cleared for action, and were to remain so until further orders." This was to be done not as an "evolution," but carefully and deliberately. Instructions were given for working without lights at night, and all ships were directed to construct wooden funnels for the stern steering light when in close order.

About one hour later the signal was made for the D SQUADRON to part company.

C SQUADRON.

July 17 a full-powered steam trial was held by the battleships. Speed was increased gradually, the trial beginning about 9 a. m. and ending at noon. For a short time every ship kept her station, but the EDINBURGH failed to keep up and signaled she was doing her best when the ALEXANDRA was logging only 10.5 knots. The trial was then abandoned. In reply to the admiral's interrogatories, commanding officers gave the speed they could maintain for two, six, and twelve hours, as follows: ALEXANDRA, 15, 14, 14; BENBOW, 15, 14, 14; SULTAN, 15, 14, 13.5; COLOSSUS, 14, 13.5, 12.5; EDINBURGH, 10.5, 10, 9.2. The record of a four-hour trial in November, 1893, gave, for the EDINBURGH at 69 revolutions, a speed of 12 knots. During the manœuvres of 1895 she made 11.5 knots for six hours. She was making 69 revolutions when unable to maintain her station.

July 18 the squadron anchored in Milford Haven about 1.30 p. m.

D SQUADRON.

July 16, after parting company, the squadron stood up the channel. July 17 was devoted to subcalibre target practice and other exercises. July 18 the squadron was organized into four subdivisions of two ships each, with the smaller vessels as lookouts. The squadron anchored in Portland Harbor at 3.30 p. m. The ships began coaling at once, which continued uninterruptedly, including Sunday, until finished. July 23 at 3.30 p. m. the squadron got under way, accompanied by six torpedo boats, and anchored in Torbay at 9 p. m. During the period of preliminary exercises the torpedo boat flotilla drilled at torpedo exercises, both day and night, practicing night attacks and evolutions in company. Details are wanting. The twenty-four torpedo boats were divided into four groups of six each to act as follows:

First group, **Nos. 50, 27, 71, 77, 81, 95**, with PHAETON, anchored inside Bardsey Island, to cruise between Holyhead and the opposite coast.

Second group, **Nos. 49, 64, 66, 76, 79, 84**, with SEAGULL, at Falmouth, from Milford Haven to Carnsore Point.

Third group, **Nos. 52, 55, 57, 58, 85, 87**, with CURLEW, at Dartmouth, from Lands End to Scillys.

Fourth group, **Nos. 59, 65, 67, 68, 73, 74**, with SPIDER, at Milford Haven, from Plymouth to Torbay.

The RESERVE FLEET was now ready and awaiting the outbreak of hostilities.

EXTRACTS FROM FIRST INSTRUCTIONS

To Admiral of C SQUADRON.

The commencement of hostilities equivalent to a declaration of war is expected on the 24th of July.

On that date the Battle Squadron of *A* will be at Bearhaven, but the cruisers will be out watching you.

The admiral of *Squadron A's* object is to entice you to sea and bring you to action before reinforcements can reach you.

After D SQUADRON has put to sea he will endeavor to prevent a junction of D SQUADRON with you until he can be joined by *B Squadron*.

Lastly, he may attempt, having failed to "meet" you, to prevent your entry into Lough Swilly.

Your primary object will be to effect a junction at a point which can not be reached by *B Squadron* in time, and "meet" *A Squadron*.

Failing that, to endeavor to "meet" *B Squadron* and enter Lough Swilly alone or with D SQUADRON before the sixth day. The objects to be attained are in their order of importance, and every effort should be made to "meet" *A Squadron* with superior numbers.

To Admiral of D SQUADRON.

In receipt of the telegram "prepare for hostilities," which may be expected early on the 24th of July, you are to proceed at once with your squadron to Torbay, and on your arrival place yourself under the orders of the vice-admiral in command of C SQUADRON.

MANŒUVRES.

The following is the general idea of the manœuvres:

The operations to take place between latitude 49 degrees north and latitude 56 degrees north, and longitude 2 degrees west and 15 degrees west.

The fleets to be ready for hostilities at noon July 24, war to continue from midnight to 8 a. m. on the sixth consecutive day.

SQUADRON C, at Milford Haven, is watched by the cruisers and small vessels of *Squadron A*, which is lying in readiness at Bearhaven.

Squadron B is at Kingstown "being organized" to cooperate with *A*. This is known to C, but *B's* strength, and that it would not put to sea for forty eight hours, is not known to C and D for twenty-four hours.

Squadron D is in Torbay "being organized," but unable to put to sea for forty-eight hours, which, as well as D's strength, is not known to *A* and *B* for twenty-four hours.

Except Lough Swilly, all the coast of Ireland and Portland are friendly to *A* and *B* and hostile to C and D. Except Portland, all the coast of England within the limits assigned, and Lough Swilly, are friendly to C and D and hostile to *A* and *B*.

A's objective is to defeat C after drawing it out of port; secondly, after learning of the existence of D, to prevent C and D from effecting junction until *A* has been joined by *B;* thirdly, to prevent C and D from finding safety in Lough Swilly.

C's objective is first to unite with D and defeat *A;* secondly, failing in this, to reach Lough Swilly, either singly or united with D, before the expiration of the time allowed.

The battleships of each squadron being present—

A is superior to C and of greater speed.

C is superior to *B*, while *B* is equal to D, but of greater speed.

If *A* meets C, the latter must return to Milford Haven.

If *A* meets D, the latter must return to Torbay.

If *A* meets C and D combined, *A* must return to Bantry Bay.

If *A* meets C after having met and defeated D in action, *A* must return to Bantry Bay; but if junction with *B* before meeting C has been effected, C must go back to Milford Haven.

If *B* meets D, no decisive result can follow, unless through the absence of battleships, in which case the inferior squadron must return to its base.

"Meeting" means battleship squadrons to be within 3 miles of each other for two hours.

The ports assigned for the assembly of the squadrons being naval bases with coast defense ships or reserve torpedo boats available, only the combined squadrons *A* and *B* can prevent C, should they meet within 20 miles of the entrance, from going into Lough Swilly; but under these conditions *A* can defeat D.

All ports used as bases as well as Portland and Lough Swilly are proof against torpedo boats.

In the meantime the cruisers were permitted, if possible, to obtain information of the enemy's whereabouts or movements.

July 24, about noon, hostilities were announced to begin at midnight to *A*, C, and D squadrons, and to *B* squadron at 7.40 p.m. After anchoring off Kingstown, *B's* plan of defense is shown in the accompanying sketch. Torpedo boats remained under way and picket boats were stationed.

Rules for putting ships out of action when "meeting."

Ship meeting.	Ship met.	Time kept.	At distance
		Minutes.	*Mile.*
Battleship	First-class cruiser	70	1
	Other cruisers	30	1
	Smaller vessels	10	1
	First-class torpedo boat	3¾	½
	Second-class torpedo boat	2	½
First-class cruiser	Cruiser	50	1
	Smaller vessel	30	1
	First-class torpedo boat	5	½
	Second-class torpedo boat	2	¼
Second-class cruiser	Smaller vessel	40	1
	First-class torpedo boat	7	½
	Second-class torpedo boat	3½	¼
Smaller vessel	First-class torpedo boat	20	½
	Second-class torpedo boat	4	¼
First-class torpedo boat	Second-class torpedo boat	5	¼
Two vessels, any class	One vessel, class next above	(*a*)	(*b*)
Any class	Same class	No.	No.
One vessel, any class, and 1 smaller.	Same class as larger	(*c*)	(*c*)

a Time double above. *b* Distance as above. *c* As above.

By smaller vessel is meant one not a cruiser that has guns above a 12-pounder and at least two R. F. (6 or 3 pounders). No ship can put two other ships out of action at the same time; each must have its separate time allowance.

No battleship can be put out of action unless met by two or more battleships or struck by a torpedo. Single ships put out of action under these rules can take no further part in the manœuvres, but must return to port of assembly and await orders from the Admiralty. The period of action is to be between the two guns which the larger ship must fire to mark it, the first to be fired when the two ships, in the judgment of the officer observing from the larger ship, are within the prescribed distance, and the second at the expiration of the time allowed. No other guns than those mentioned above are to be fired in action between single ships, but, though gun fire will have no part in deciding the issue in fleet actions, yet to make the exercise of going to quarters more complete admirals in command of fleets meeting are to use blank ammunition at their discretion. Admirals having torpedo boats under their orders can establish torpedo-boat stations at any ports in their territory, and, similarly, admirals having "destroyers" in their fleets can establish destroyers' stations in their own territory. All islands, except Bear Island, are neutral, and can not be used as bases of operation.

Channel Fleet.

A Squadron.—July 24, at 1 p. m., the cruisers were sent out by divisions; the first division, composed of the *Apollo*, *Naiad*, and *Sirius*, was to be off Milford Haven before midnight; the second division, *Thetis* and *Tribune*, and the third division, *Forth* and *Severn*, were to serve as linking ships, and to keep touch between the first division and the signal stations on the Irish Coast until the departure of *A*.

July 25 lay at anchor cleared for action until 4 p. m. Although not attacked during the preceding night, every preparation was made for defense, and picket boats patrolled the harbor entrance. The torpedo boats and cruisers were sent out on scouting duty, particularly to keep touch with C.

July 25 the *Boxer* claimed to have torpedoed the SULTAN about 1 a.m. while C was steering south from Milford Haven. The COLOSSUS's claim that she sank the *Boxer* was allowed. The torpedo boats put in at Kingstown, coaled, and immediately went to sea again.

The *Naiad* sighted the Smalls Light at 1.30 a. m.; she reported sighting two men-of-war at 1.50 a. m., and heard heavy firing at 3.45. At 7.15 a. m. she proceeded to Milford Haven, and at 9.30 a. m. saw there were no men-of-war in Dale Roads. Heading for Carnsore, past the Smalls, she spoke the *Forth* at noon and heard from her the *Apollo* was off Carnsore, with which vessel she communicated at 1.40 p. m. and proceeded to Bearhaven under orders to join the admiral. At 3.20 p. m. the *Apollo* had communicated with Carnsore Signal Station. The *Naiad* reached Bearhaven July 26 at 1 a. m. She rejoined *A* the same day at 9.30 p. m.

The *Sirius* sighted the Smalls at 2.20 a. m. At 5.55 a. m. sighted the *Boxer*, who reported C had left Milford at midnight and was steering SW. by S. The *Boxer* was directed to proceed at once to Carnsore Point to telegraph the admiral, "a signal which the *Boxer* does not appear to have understood, for it was not acted upon." The *Sirius* started full speed for Bantry Bay, where she arrived at 5.05 p. m., meeting *A* coming out.

The movements of C reached *A* by telegram from *B* about 3 p. m. At 4 p. m. the battle squadron, accompanied by the *Harrier*, *Hussar*, and *Spanker*, was underway. Outside, about 6 p. m., the cruiser *Sirius* signaled that C had escaped; that the torpedo boat *Hunter*, from whom the information had been obtained in the morning, had been ordered to the signal station at Carnsore Point to telegraph, while the *Sirius* steamed at full speed for Bearhaven; and that C was steering SSE. *A* steered at once for a point 25 miles south of the Scilly Islands, at 11.5 knots, to observe the entrance of the English Channel. The only cruiser with the battle squadron was the *Sirius*, the others being in the neighborhood of Milford Haven; hence the range of observation for Vice-Admiral Kerr was limited to the area covered by the four light vessels still with him. At midnight Vice-Admiral Kerr opened his final instructions, and learned for the first time that *D* was at Torbay, and not permitted to get underway until forty-eight hours after the beginning of hostilities.

July 26, speed was increased to 13 knots to attain the station off Scilly Island. Before 4 a. m. the cruisers *Thetis* and *Tribune* fell in with the *A* battle squadron, increasing the scouting capacity. Nothing was seen of C, and course was changed after passing Scilly outside the range of the signal station there. During the forenoon hostile cruisers were sighted to the eastward of Lands End. *Squadron A* was discovered at 11.45 a. m. by the IRIS, that steamed at full speed to report off the Lizard to the GALATEA. Late in the afternoon four of the enemy's scouts, the cruisers MERSEY and IPHIGENIA, and torpedo vessels LEDA and RENARD, were sighted off the Lizard and chased by the *Forth*, *Severn*, and another cruiser, but escaped. About 6 p. m. Lands End was reached, where the battle squadron was joined by the rest of the *A* cruisers. Course was then shaped for Waterford, off which place was the rendezvous with *B*. At this time the possibility was thought to exist of preventing the junction of C and D. The whereabouts of C remained unknown, though *A's* course showed either that C was not to the westward of Lands End or so far to the westward as to be unable to reach that point before D. C also might be to the eastward of Lands End, but considering that his instructions had made known to him the existence of D twenty-four hours after the declaration of hostilities, Vice Admiral Kerr concluded C would be equally delayed. About midnight course was changed again for Lands End. At the same time the *Forth* was sent to notify *B* and to inform Rear-Admiral Powlett of a new rendezvous. July 27, a torpedo boat made an attack about 4 a. m., but day was breaking and the boat was put out of action. Reaching Lands End about 6 a. m., the cruisers that had been scouting rejoined the squadron. The *Sirius* reported she had observed C and D battleships at anchor in Torbay about 5.30 p. m., July 26; she counted nine battleships, two cruisers, and three torpedo vessels. Hence the second objective also had failed. About noon the torpedo boats *Handy* and *Lightning* rejoined, reporting they had left the *B Squadron* about 25 miles south of Waterford at 9.30 a. m. The *Hussar* broke down and was sent to Queenstown for repairs.

Two courses were open after junction with *B*, either to attempt to intercept the enemy somewhere between Lands End and Lough Swilly or to steer at once for the latter port and prevent ingress. Course was shaped accordingly to meet *B*, and the rendezvous was passed. *A's* departure from Lands End was noted by the enemy's cruisers, but they were driven off and it was hoped junction with *B* was not observed. Junction in latitude 50° 50′ north, longitude 6° 15′ west, was effected about 2 p. m.

B Squadron.—July 26, at midnight, the squadron got under way for the rendezvous with *A* off Waterford. The cruisers were sent out in advance. July 27 lights were masked during the night, although the sea was smooth, with bright moonlight. Speed was 14 knots, and the rendezvous was reached about 8 a. m., where the *Forth* signaled orders from Vice-Admiral Kerr to join him as quickly as possible 20 miles north of Longships Light. Course was changed at once to the southward and speed increased to 15 knots. The torpedo vessel *Speedy* was fallen in with soon after. She reported having left the *A Squadron* the afternoon of July 26 to recall the cruisers *Sirius* and *Tribune* and to rejoin the admiral at a rendezvous at 8 a. m., July 28, 5 miles south of Dunmore. Chased by six of the enemy's cruisers, she had been unable to carry out her orders. At 5 p. m. July 26, however, she had captured torpedo boat **No. 58** off Eddystone light. About 1.30 p. m., July 27, the main body of *A* was sighted. Junction was effected fully 60 miles north of the Lands End rendezvous. *B*, by signal, took station on the starboard beam of *A*, distance 8 cables. The united fleet shaped course for Cape Clear.

UNITED SQUADRONS.

The two courses open to Vice-Admiral Kerr were to reach Lough Swilly by either the eastern or the western coast of Ireland. Presumably when last seen by the hostile scouts the *A Squadron* was standing up the Irish Channel; hence the presumption that Vice-Admiral Seymour would be so informed. Adding to this the fact that the hostile torpedo boats were along the eastern route, Vice-Admiral Kerr determined to choose the western route, and to attempt, first, to intercept the RESERVE FLEET off Cape Clear; secondly, failing in this, to push for Lough Swilly. Accordingly course was shaped for Cape Clear, which was reached about 8 p. m. Scouts were extended about 15 miles to the southward, but no signs of the RESERVE FLEET were seen. The torpedo vessels *Harrier* and *Speedy* and the cruiser *Severn* were sent up the east coast to search for torpedo boats. During the early evening the torpedo boat *Lightning* rejoined.

July 28, during the early morning, the *Severn*, *Harrier*, and *Speedy* rejoined with a report from the injured *Bellona* that she had seen the

RESERVE FLEET steaming up the Irish Channel near the English Coast.

About 9 a. m. Assistant Engineer Good of the cruiser *Hermione* fell overboard while the fleet was steaming 14 knots. The first lieutenant, Mr. A. R. C. Warren, jumped overboard to attempt his rescue. Both officers were drowned. The *Hermione* turned out of line, being at the time the rear ship of the starboard battleship column. Both lifeboats were lowered, but neither officer was reached. The life buoys were picked up and the ship steamed ahead full speed to retake her station. The fleet reached Lough Swilly at midnight.

July 29: The night was dark and squally, and it was impossible to discover whether the RESERVE FLEET had reached the port. Several cruisers were seen, but it was not until 2 a. m. that communication was established with one that proved to be the *Bellona*. She reported the signal station at Malin Head had signaled about 9 p. m. that no enemy had entered Lough Swilly; also that at 2 p. m., July 28, the signal station at Brow Head had seen a fleet passing. The battleships formed column of vessels at 3 cables on the line from Tory Island to Inishtrahull. The cruisers on the arc of a circle distant 10 miles from the battleships, and the smaller vessels still farther off. The day was spent cruising in the neighborhood of the port between Malin Head and Tory Island. The cruisers, except the *Thetis*, that had been sent to Queenstown for repairs, and nearly all the torpedo vessels, rejoined between midnight and 6 o'clock, showing close calculation by the admiral and by the cruisers.

July 30: The night again was thick, but nothing was seen of the enemy, although the lookout was of the best. Just before dawn the cruiser IRIS was made out to the SSE., accompanied by the torpedo vessels CIRCE and RENARD, standing to the northward. The *Channel Fleet* stood west about 4 miles, and then headed back for Lough Swilly. The fog shut in thicker than before, while the fleet stood NE. At 6.10 a. m. the fog lifted and the RESERVE FLEET was made out standing in from the eastward and too near the harbor entrance to be intercepted. At this time the *Channel Fleet* was about 3 miles distant from Fanad Point at the western entrance.

The *Channel Fleet* then steamed at slow speed to Kingstown, where it anchored July 31, at 7 a. m. The cruiser *Bellona* was sent into Moville Lough with a telegram to Vice-Admiral Seymour to join at Kingstown, and the cruiser *Severn* was left off Lough Swilly to send all cruisers and scouts to join the fleet.

RESERVE FLEET.

C SQUADRON.—July 23, the squadron unmoored and dropped down from Milford to Dale Roads, where the vessels rode at single anchor. The importance of unmooring was shown by the time taken for the five battleships to complete the evolution. The signal was made to begin unmooring at 1.30, and 3 p. m. to leave the anchorage. At that time only the ALEXANDRA and COLOSSUS were ready, a variety of accidents delaying the other ships. All the vessels were not at the new anchorage until after 5 p. m.

July 24, preparations for sea were made. At 1 p. m. the first scouts, the GALATEA and IRIS, cruisers, and ONYX, torpedo vessel, were sent out to reconnoiter to the westward, while the second scouts, the cruisers AUSTRALIA and TERPSICHORE, were sent to the NW. All were to return before dark.

The orders to the cruisers were as follows: Form column NW.-SE. 20 miles off St. Anns Head, TERPSICHORE to NW., then AUSTRALIA, LEDA, RENARD, GALATEA, IRIS, ONYX, MERSEY, and IPHIGENIA, in the order named, 5 miles apart. When battle squadron, masked by the cruisers, comes within 5 miles of them the cruisers will steer for the Longship light at 11 knots. TERPSICHORE steers SW. by W. 65 miles, and then steers directly for Longship light. Cruisers to increase distance to 15 miles ahead of battle squadron. Enemy's cruisers, if met, to be driven back. Battle squadron to go up Channel to Torbay. First and second scouts and both divisions of lookouts off Lands End and Lizard to watch for enemy. Second scouts, AUSTRALIA and TERPSICHORE, near Lands End, report from signal station at Sennen Cove, telegraphic information to Lizard, Prawle Point, and Torquay. First scouts GALATEA, IRIS, and ONYX same duties at Lizard. First lookouts cruisers MERSEY and IPHIGENIA, with second lookouts torpedo vessels LEDA and RENARD, keep 20 miles NW. by W. of Lands End. All retreat to Torbay or else southward to sea.

The cruiser PHAETON, convoying six torpedo boats, also went to sea. They were to form a connecting patrol between Bardsey Island and Wicklow Head during the night. Several of the cruisers returned as late as 9.30, reporting they had seen nothing of the enemy. By 10.30 all cruisers and torpedo vessels except two had gone to sea. The squadron weighed at midnight.

July 25, course was shaped to the southward and westward at 10 knots. A moderate gale from the southward was blowing, with rain, and the night was dark. The weather moderated somewhat toward morning, the wind backing to the eastward, but a fog came on, necessitating a reduction of speed. The weather cleared, however, about 9 a. m., with the squadron heading between the Wolf light and the mainland. The cruiser IPHIGENIA was picked up here; also the MERSEY and the torpedo vessels CIRCE and NIGER; the GALATEA was with the battleships. The CIRCE was sent to communicate with a friendly signal station. Lands End was passed at 10 a. m. By noon the weather cleared and speed was increased to 11.5 knots. It is to be noted that the EDINBURGH apparently had no difficulty in keeping station. During the afternoon scouts reported some of the enemy's scouts had been seen from Holyhead and off the coast of Cornwall. Two cruisers, the GALATEA and IRIS, were sent to examine the neighborhood of the Scilly Islands. They were especially active; they drove back the *Thetis*, discovered and reported the approach of *A Squadron* and watched its movements. As soon as it passed they chased the *Apollo*, *Forth*, and *Severn* with such energy that the GALATEA was on the point of firing the first gun when *A Squadron* was sighted returning. They remained in sight until the squadron turned Lands End. The battle squadron anchored in Torbay at 8 p. m. without having been molested.

The cruiser AUSTRALIA left Lands End on the morning of July 25, in company with the TERPSICHORE, to reconnoiter to the NW. During the afternoon two of the *A* cruisers were chased, but escaped, owing to superior speed. July 26, at 5.30 a. m., the two cruisers were off St. Anns Head, but obtained no information. Steering up St. Georges Channel a report was made at 7 p. m. to the signal station in St. Brides Bay that nothing had been seen, and the TERPSICHORE went to the St. Anns Head for orders. She returned with notice of a rendezvous at daylight 20 miles SSW. of the Lizard. To reach this was an impossibility, as there were only six hours in which to make 130 miles.

July 27, at 6 a. m., the cruisers were off the Longships in an effort to rejoin the RESERVE FLEET by intercepting it. At 6.30 a. m. they sighted a fleet rounding the Lizard, about 15 miles from it, which was soon recognized as the *Channel Fleet*, and this information was communicated to the Sennen Cove signal station for telegraphic transmission. Injury to a feed pipe aboard the TERPSICHORE had happened the evening before, reducing her speed to 14 knots, but by this time it was repaired, making her again faster than her consort. The cruisers steamed to the NE., well under the land, hoping later to be able to double back and rejoin their own fleet, but at 10 a. m. they were chased by three cruisers, the *Apollo*, *Naiad*, and *Sirius*, all faster than the AUSTRALIA. Every effort was made at 11 a. m. to increase speed, hoping to reach Milford Haven, 75 miles distant. The enemy slowly gained, and at noon the engineer's force was formed into two watches, increasing the AUSTRALIA'S speed to 16 knots.

Having approached within a mile, the enemy fired a gun to indicate the beginning of the one hundred and forty minutes necessary for a capture. The TERPSICHORE a few minutes afterwards changed course to the westward, while the AUSTRALIA headed south, but the three cruisers continued to follow the latter, and a mimic battle took place, guns being trained, ships manœuvred, etc., as in real warfare. At 2.40 p. m. the AUSTRALIA, under the rules, surrendered and proceeded to Milford Haven to await orders. The TERPSICHORE escaped.

D SQUADRON.—July 24, the battleships rigged torpedo nets and at midnight took night stations to resist torpedo attack.

July 25, every light was screened, except the stay lights, which, of course, would indicate the ships' positions. The night was favorable for torpedo attack, being cloudy and with frequent rain squalls, but no attack was made. The torpedo boats were outside during the night to guard against surprise.

It was reported that the torpedo vessel SEAGULL had torpedoed the cruiser *Thetis*, of the *A Squadron.*

News was received during the morning from the signal station that C SQUADRON had put to sea at midnight, and that nine ships steering west had been seen at 9.30 a. m. off Sennen Cove. At noon signal was made to be ready for sea at midnight. At 5 p. m. news was received that five battleships and two cruisers were sighted at noon off the Lizard, steering east, and at 8 p. m. the battleships of C anchored in the harbor, raising the united force to nine battleships and nine smaller vessels.

UNITED SQUADRONS.

C SQUADRON began to coal at once and continued doing so until bunkers were full. July 26, coaling was finished during the forenoon; steam was ordered for 11 p. m., full speed; ships to weigh independently and to proceed out of harbor, all lights to be masked. Outside, the third organization again would be taken up. At midnight the vessels left the harbor.

July 27, the night was fine and clear, with bright moonlight. Course was shaped down channel and the fleet formed column of divisions, the ALEXANDRA and SANSPAREIL leading, with the available cruisers and torpedo vessels disposed ahead and to port on the lookout for the enemy Speed of battleships, 12 knots.

At 5.45 a. m. eight vessels were reported in sight, the fleet being then about 20 miles from Lands End, which proved to be the rest of the RESERVE cruisers, except the AUSTRALIA, TERPSICHORE, MERSEY, and torpedo vessel LEDA. They reported that the MERSEY had been seen and chased away to the northward; also that the *A Squadron* had been seen at 10.50 p. m., July 26, steering NW. from Scilly Islands. The INDEFATIGABLE was sent in there for news, while the fleet stood about SW. to avoid *A*, supposed from the reports to have gone north to effect junction with *B*, and then possibly to return. There were two courses open to the RESERVE FLEET—either to steam north, passing up St. Georges Channel, or to head for Cape Clear and around the west coast of Ireland. The fleet steamed for one hour to the westward and then headed for Lands End, which was passed about 5.30 p. m. At noon the crusier BRILLIANT was sent to the Scilly Islands for information, and the torpedo vessel SHARPSHOOTER to find the INDEFATIGABLE and to inform her of the movements of the fleet.

Trevose Head signal station reported an engagement between five cruisers about 1 p. m., evidently the capture of the AUSTRALIA, previously related. At 5 p. m. Sennen Cove station reported through the BRILLIANT that at 10.30 a. m. the *Channel Fleet* was standing up the Irish Sea. Course was altered to the southward, and the fleet passed

Scilly again, heading WSW. During the night nothing was seen of the enemy. It was hoped the hostile cruisers had been eluded; the cruiser IRIS reported the fleet had not been followed.

July 28, at 8 a. m., the fleet was about 100 miles south of Cape Clear, and course was changed to skirt the west coast of Ireland, keeping out of the range of the signal stations. The weather was clear and calm, with a smooth sea, and the fleet made good progress, a speed of 12 knots being attained. During the afternoon the sea and wind rose and the weather became thick. An accident to the starboard engine of the BENBOW delayed the fleet about two hours, speed being decreased to 5 knots. Nothing of any importance took place during the night.

July 29, after midnight, the wind and swell went down, but the weather remained thick and rainy. At early daylight the GALATEA, BRILLIANT, INDEFATIGABLE, and IRIS, cruisers, and CIRCE, JASEUR, RENARD, and SHARPSHOOTER, torpedo vessels, were sent ahead to reach the rendezvous from which at a certain time they were to approach Lough Swilly from the east. After passing Achill Head the fleet steered for latitude 55° 50′ north, longitude 9° 25′ west. Orders were for the squadrons to separate should *A* and *B* together be met, and D was to make for Lough Swilly. It was hoped to reach this rendezvous at 8 p. m., but the time was nearly 10 p. m. when the fleet arrived there.

From the rendezvous, about 70 miles northwest from Lough Swilly, the battleships formed column of vessels, the ALEXANDRA leading and the SANSPAREIL sixth in column. All lights except the taffrail light were masked, and course was shaped direct for Lough Swilly. The cruisers steered a circular course, to approach from the eastward.

July 30, course was held during the night, and at 5 a. m. a hostile torpedo vessel was sighted. At the time the RESERVE cruisers approached the coast the weather was thick, but an hour later, about 6 a. m., the weather cleared sufficiently for the battleships to enter without difficulty. When the mist was thick the CIRCE, IRIS, and RENARD missed the entrance to Lough Swilly and were discovered by the *Channel Fleet* and chased, but, finding the entrance, escaped. It is thought the *Channel Fleet*, upon abandoning the chase of the cruisers, withdrew to the northward, leaving the western line clear. When the RESERVE FLEET was at the harbor mouth steaming, in the *Channel Fleet* was made out to the northward too far distant to prevent entry. Victory rested with the RESERVE FLEET. The anchorage was reached about 6 a. m. After target practice and inspection the vessels returned to their former stations.

TORPEDO BOAT FLOTILLA.

July 24, the first group or division weighed at midnight and took station from Bardsey Island to North Arklow light, about 7 miles apart, in the following order: **No. 27,** at 7 miles from Bardsey Island; **No. 50, No. 71, No. 77, No. 81, No. 95,** and the PHAETON about 22 miles out.

The fourth division, with the SPIDER, patrolled off the Smalls, and returned to Milford the morning of July 25.

July 25, at 9 p. m., to intercept *B*, if possible, the PHAETON and five boats proceeded on slightly divergent courses toward the Irish coast with orders, after running 52 miles, to alter course to south toward Bishops light, and then to proceed in company to Milford, where they arrived at 6.30 a. m., July 26, without having obtained touch with the enemy.

July 26, at 8 p. m., the PHAETON and SPIDER, with the ten available torpedo boats of the first and fourth divisions, went out and established patrol between Bishops and Tasker lights, **No. 81** nearest the Irish coast. All except **No. 81** returned to Milford in the morning. **No. 81** had met with an accident to her rudder, but reached port during the afternoon. She took no further part in the manœuvres. **No. 95** rejoined from Holyhead July 27, having escaped the Kingstown torpedo boats.

July 24, the second division left Falmouth at 9.30 p. m. to scout off the Lizard, but soon returned to harbor, owing to bad weather.

The third division left Dartmouth at 9 p. m., scouting from the Start to Mewstone, and returned to port in the early morning.

July 25, the second division scouted off the Lizard from 9 p. m. to 4 a. m., but saw nothing.

Nos. 85 and **87**, of the third division, were outside for about one hour.

July 26, the second division remained at Falmouth awaiting orders.

Of the third division, **No. 87** went to Torbay and returned to Dartmouth at 1 p. m.

Under orders to combine with the second division, the third division left Dartmouth at 1.45 p. m. Near the Eddystone light at 5.10 p. m. the *Speedy* and *Spanker* were sighted, coming up channel, and immediately chased. Under signal from **No. 87** to disperse, **Nos. 85, 52,** and **55** made for the land, while **Nos. 87, 57,** and **58** went to the southward. The *Spanker* captured **Nos 87** and **57**, while the *Speedy* took **No. 58.** **No. 57** claimed to have torpedoed the *Spanker*.

No. 58 returned to Plymouth and took no further part in the manœuvres.

No. 52, returning to Milford, was captured at 4 a. m., July 27, by the *Repulse.*

July 27, the PHAETON, with eleven boats of the first, third, and fourth divisions, got under way to meet C, or else to patrol the channel and intercept enemy's vessels. Before darkness set in four hostile torpedo boats were seen off Grassholm Island. Although signal was made to close on the PHAETON, the boats were unable to do so, and an attempt was made to return to Milford, the enemy following. The PHAETON was unable to effect capture, as six minutes was the longest time she could keep them within one-half mile, whereas seven minutes was required by the rules.

The *Boxer* captured **No. 73** while coming out to join the flotilla and one other boat, while the *Bruiser* captured one as well.

The PHAETON was making 15 knots, but the superiority of speed of the *A* torpedo boats rendered their capture as impossible as the escape of the smaller boats.

July 26 the second division left Falmouth at 9 p. m. and cruised toward the Scillys.

July 27 at 4 a. m. they rejoined the SEAGULL 5 miles south of the zard and shaped course for Milford Haven. The *Thetis* was sighted at 5.30 a. m. and the flotilla prepared to attack. At 5.54 the *Thetis* fired the first gun and manœuvred at 16.5 to 17 knots to keep the boats within one-fourth of a mile. At the expiration of twenty-one minutes they were all adjudged out of action. **Nos. 49, 64,** and **84** each fired a torpedo at her and the SEAGULL two; the *Thetis* avoided the first and the others missed her. After the twenty-one minutes had elapsed **No. 49** missed again, the torpedo passing under the *Thetis*. About twelve minutes too late, **No. 79** fired a torpedo which struck the *Thetis* amidships. **No. 66** did not fire and **No. 76** failed owing to missfire. For a further period of forty minutes the SEAGULL was kept under fire and captured.

Within about three days thirteen torpedo boats had been captured.

July 28 the PHAETON and the remaining boats searched for enemy's vessels but found none.

July 29 the flotilla remained at Milford Haven owing to bad weather. At 10 p. m. the SPIDER, SEAGULL, and second division went out but returned on account of the bad weather.

FORMATIONS AND EVOLUTIONS.

The *Channel Fleet* was organized into two divisions of battleships and seven divisions of cruisers and torpedo boats. Cruiser divisions were distinguished by rings, balls, or stripes painted on the smoke pipes. Two bands on after pipe indicated the fourth division; one ball on forward pipe the fifth division, following generally the system used last year (p. 178, No. XV). The torpedo vessels and torpedo boats had the number of the division in white letters 2 feet long on either bow.

The cruising formation was: Battleships in column of divisions, natural order; distance between vessels, 2 cables; between divisions, 6; one division of cruisers 1 point on the starboard bow of the commander-in-chief; a second division similarly placed on port bow of the second in command; two divisions—one to starboard, the other to port—bearing four points on the bow, two divisions—one on either beam and one astern—all distant 1 mile from the nearest battleship. At a distance of 6 cables from the battleships the seven divisions of torpedo vessels and torpedo boats were stationed on similar lines. At night the distances were increased to 2 miles and 10 cables, respectively. The torpedo vessels were to be linking ships in case the cruisers were detailed on scouting duty in the immediate vicinity of the battle fleet. The *Channel Fleet*, being composed mainly of vessels already in commission, did not require the elementary tactical drills necessary for the **RESERVE FLEET**. Scouting exercises and long-distance signaling were practised frequently. There was no delay in anchoring, getting under way, mooring, or unmooring. It is probable, in instituting comparisons between the fleets, that the modern character of the *Channel Fleet* accounts for part, at least, of the difference shown in handling anchors and chains.

When the *B Squadron* anchored at Kingstown July 24 the heavy vessels anchored in column of divisions, the battleships to seaward. (*See* sketch, p. 27.) Cruising off Lough Swilly, column of vessels was the formation at distances as far apart as the weather would permit. An important point, and one to which too much attention can not be directed, is the handling of the *Channel Fleet* on several occasions without the usual signals. As noted by one of the best observers, "the use of signals easily degenerates into abuse, and nothing can be more totally unlike war than the bridge of a battleship during some fleet evolutions. * * * The best-trained fleet is that which can be freely handled with the minimum of signals. Evolutions under the conditions of action ought to be far more frequently practiced than is at present the case. An officer accustomed to handle a ship from his bridge only, with a dozen men around him watching to carry out his least order, would find himself in sore difficulty if confined to the inside or the lee of his conning tower."

The **RESERVE FLEET** was organized into two divisions, each composed of six battleships or cruisers acting as such, with scouts and linking ships attached. (*See* p. 21). The cruising formation was: Scouts disposed abeam and broad off the bows of the battle fleet, with linking ships between; battle fleet in column of divisions, natural order; distance between ships, 2 cables.

The principal drills and evolutions were fog drill, forming line, column, divisions, and change of course. The light vessels were exercised constantly at scouting and to test the alertness of the signal stations.

Leaving Plymouth to begin the drills and exercises, five hours were required to unmoor. The fleet anchored in Falmouth Roads in cruising formation; there was no delay unmooring or leaving the harbor. The fleet weighed together and inverted the order of vessels before clear of the anchorage. During the run up the west coast of Ireland the formation was: Column of divisions, with the scouts ahead covering a smaller area than under former circumstances; when steaming from the final rendezvous for Lough Swilly, column of vessels was taken, to contract the front as much as possible.

COALING.

Arrangements for coaling and coal supply seem to have been ample. As far as can be ascertained, there were no complaints on this score, nor, as last year, about the condition of coaling gear (No. XV, p. 179). Four retired officers in charge of coaling arrangements and colliers were appointed, as last year. They were attached to the flagships. Several colliers were fitted each with two Temperlay transporters; others with one; others were without them. These last were used principally to coal the smaller vessels. Rate of coaling is an important question, for on it may depend the mobility of the fleet or the command of the sea.

Some good times were made by the *Channel Squadron* when at Portland preparing for the manœuvres.

The following are some of the coaling times:

Channel Fleet.

Name.	Time.	Tons.	Average tons per hour.
	Hours.		
Majestic	8½	796	93.6
Magnificent	9½	870	91.6
Resolution	8¾	745	85.1

In one hour the *Majestic* took in 125 tons.

B Squadron.

Name.	Time.	Tons.	Average tons per hour.
	h. m.		
Magnificent	5 25	521	96.1
Blenheim	4 00	215	53.75
Hermione	7 15	210	28.9
Charybdis	14 45	280	18.9
Melpomene	6 45	180	26.6
Bellona	4 30	140	31.7
Latona	6 35	180	27.3

C SQUADRON.

ALEXANDRA	4 45	167	35
SULTAN	....	....	27
BENBOW	....	....	21
COLOSSUS	....	....	30
TERPSICHORE	3 25	200	58.8
IPHIGENIA	3 40	170	46

The following was the coal consumption, in tons, reported for five days in the D SQUADRON RESERVE FLEET: SANSPAREIL, 192; THUNDERER, 185; DEVASTATION, 129; DREADNOUGHT, 203; MELAMPUS, 96; PEARL, 118; INDEFATIGABLE, 125; BRILLIANT, 170; SHARPSHOOTER, 52; SHELDRAKE, 60; JASEUR, 46; JASON, 52. One week's expenditure is given as follows: ALEXANDRA, 143 tons 18 cwt.; SULTAN, 224 tons 5 cwt.; EDINBURGH, 230 tons; COLOSSUS, 225 tons; BENBOW, 196 tons. Two days' expenditure, one ordinary steaming the other full power, for these vessels is reported, in tons, as: ALEXANDRA, 20 and 30; SULTAN, 30 and 42; BENBOW, 30 and 40; COLOSSUS, 26 and 38; EDINBURGH, 37 and 45. Coaling in Portland the D SQUADRON improved its rate of coaling. In six hours the DREADNOUGHT took in 269 tons, nearly 45 tons an hour; the DEVASTATION 225 tons in six hours, about 37 tons an hour. On the other hand, however, some of the coast-guard cruisers coaled only at the rate of 14 tons an hour.

Coaling at Bearhaven the *A Squadron* did not equal the record made by the *Channel Fleet*. The battleships took from 440 to 460 tons each. The *Royal Sovereign* averaged about 96 tons; the *Majestic*, 94; the *Repulse*, about 84; the *Empress of India*, 75, and *Resolution*, 62. The final coaling of the C SQUADRON took place partly at night, the battleship BENBOW beginning at 10.30 p. m. At this coaling the EDINBURGH averaged 47 tons. Much of this coaling work was very fatiguing, and instances are cited where the greater part of ships' companies had worked over twenty hours. It is reported in the press from Portland that the *Empress of India* received coal at the rate of 122 tons an hour, and the *Majestic* at the rate of 120 tons an hour. It is reported from St. Lucia, West Indies, that the cruiser *Talbot* was supplied at the rate of 141 tons an hour, and the cruiser *Crescent* at the rate of 132 tons an hour. It also is stated the German cruiser *Kaiseren Augusta* was coaled at Malta with 707 tons at an average of 176¾ tons an hour. In the other cases mentioned the quantity delivered is not given.

SIGNALS.

The masts of the battleship COLOSSUS were lengthened for signal purposes. For long-distance day signaling the masthead semaphore has been adopted, and for night work the multiple fiber flash lamp. The collapsible drums were not used.

Flags displayed from wire rope stretched between topmasts were used in a manner somewhat similar to that of last year (p. 181, No. XV). The search lights also were used at night. At scouting practice in the *Channel Fleet* each group opened to a distance of 10 miles between ships. Each leader was thus 30 miles from the flagship. It was found that in clear weather flag signaling can be carried on up to 10 miles. More precise details are wanting.

TARGET PRACTICE.

The usual target practice, both subcaliber and battery practice, took place. It was devoid of especial features.

CASUALTIES.

BATTLESHIPS.

BENBOW: July 13, developed minor defects in machinery; repaired at sea. July 27, slight injury to starboard H. P. indicator pipe; repaired in an hour.

COLOSSUS: July 24, while steaming into a head sea sheet chain broke adrift and chafed the bow; could not be secured until weather moderated.

DREADNOUGHT: July 19, slight defects in machinery.

EDINBURGH: July 13, cat chain carried away when weighing anchor. No damage done, though a man was at the time on the anchor.

Resolution: July 17, collision with *Repulse*, scraping along her starboard side when retaking station. *Repulse* only slightly injured and a small hole in starboard side above water line. *Resolution* lost a port boat, boat davits, port accommodation ladder, and sustained other damage along port side; July 28, steering gear broke down twice.

SULTAN: July 13, capstan gear defective. As about one month would be required to put it thoroughly in order, repairs were postponed until after the manœuvres. Hand gear was used.

CRUISERS.

Andromache: July 23, steering gear temporarily disabled.

AUSTRALIA: July 10, defective distiller. Repaired by Keyham mechanics, but the ship did not go into port.

Bellona: July 27, could not keep station in *B Squadron* and dropped astern, cause not ascertained. Rejoined about midnight July 28.

CURLEW: July 23, steam steering gear broke down after arrival in Torbay.

Forth: July 9, defective distiller. Returned to Plymouth for repairs.

Hermione: July 28, lost overboard Assistant Engineer Good. Lieutenant Warren, the first lieutenant, jumped overboard and also was lost while attempting his rescue.

INDEFATIGABLE: July 10, eccentric sheave of steam capstan cracked. Sent in to Keyham for repairs. Rejoined July 15.

IRIS: July 8, accident to starting gear. July 11, some slight defects in machinery. Repaired by force aboard.

LANDRAIL: July 11, collision with merchant vessel *Siren*. Injured stem, fore compartment filled, but temporary repairs were made and she returned to Portsmouth. The *Siren* was cut in two and sank. Crew saved.

Melpomene: July 23, speed fell to 14 knots, owing to defects in machinery.

PHAETON: Trouble in keeping water in her boilers, thought to be due to insufficient loading of the escape valves to the feed pumps.

Severn: July 20, steam steering gear broke down, but was repaired in half an hour.

TERPSICHORE: July 25, feed pipe of forward boiler gave out. Repaired by force aboard.

Thetis: July 27, starboard engine disabled. After reaching rendezvous, sent to Queenstown for repairs.

TORPEDO VESSELS.

CIRCE: July 27, dropped astern of fleet, probably owing to choked tubes.

Harrier: July 9, slight defect in boiler. Repaired at sea.

Hussar: July 27, air-pump delivery pipe broke down. Sent to Queenstown for repairs. July 28, slight injury to machinery while putting in to Queenstown for repairs. Grounded off Spitbank Lighthouse, but got off in about two hours without injury.

JASEUR: July 17, at 4 a. m., the cover of feed-valve box blew out. She kept station under one boiler and by 1 p. m. repairs were finished.

JASON: July 17, eccentric gear of port engine broke; repaired at Plymouth.

ONYX: July 11, slight defects in machinery; July 27, tubes choked.

SHARPSHOOTER: July 20, had a boat run into and capsized, but no lives were lost.

SHELDRAKE: July 27, could not keep station owing to choked tubes.

SPIDER: July 10, while convoying torpedo boats, cracked main steam pipe; compelled to return to port; repaired at Keyham.

TORPEDO BOATS.

Daring: July 9, breakdown in armature; July 20, defective condenser; repaired at Bearhaven, working day and night.

Decoy: July 14, defective slide valve, piston rod of feed pump broken; repaired at Plymouth and rejoined July 15 at 5 p. m.; exceptional rapidity; July 23, developed a defect in port engine; quickly repaired.

Havock: July 8, a small fire occurred in bread room; easily extinguished, but little damage done.

Opossum: This vessel developed so many defects during trials prior to the manœuvres that she was withdrawn from the list of mobilized vessels and was replaced by the *Hunter*. July 9, while the *Opossum* was making a run for the instruction of men of the engineer's force she ran on a ridge of rocks off Scilly and damaged her propeller blades.

Porcupine: July 29, engine disabled; repaired at Londonderry.

Skate: July 9, bracket of starboard shaft broke while undergoing trial in the channel and several bottom plates were loosened. The after compartment was nearly filled, but the vessel succeeded in getting back to harbor. The *Skate* was to be held in reserve to take the place of any torpedo boat absolutely disabled.

No. 27: July 30, fouled the SPIDER and sustained sufficient damage to require docking.

No. 50: July 29, slight defects in engine; repaired by 8 p. m.

No. 52: July 19, defects in feed pipe; sent to Plymouth for repairs.

No. 63: July 10, leaky condensers.

No. 65: July 10, developed defective steering gear; lost a man overboard off Milford; the commanding officer, Sublieutenant Viscount Kelburne, nearly lost his life trying to rescue the man.

No. 68: July 10, leaky condensers.

No. 73: July 9, developed defects in the machinery and was detained at Chatham for repairs.

No. 76: July 8, propeller blades came unkeyed and fell away from box. She was towed into Portsmouth by **No. 91**.

No. 79: July 11, steering gear defective. By working all night, the Plymouth mechanics got her ready to leave with the rest of the flotilla.

No. 81: July 26, while patroling off Bishops Light, seriously damaged the stern plates through the dropping of the rudder. It was temporarily secured and she reached Milford Haven during the afternoon of July 27. She took no further part in the manœuvres.

No. 87: July 26, lost a torpedo during drill.

No. 94: July 6, while making passage from Portsmouth to Sheerness came into collision with schooner *Reaper*. Both were damaged. Had the sea been rough the schooner would have foundered. **No. 94**, however, was able to tow her to Portsmouth. The bow torpedo tube flap of **No. 94** was bent forward, smoke pipe crushed, and she sustained other damage. The crew was transferred to **No. 49**.

No. 95: July 24, cylinder damaged; rejoined flotilla July 27 at Milford Haven.

ADDITIONAL.

December 24, a torpedo boat attack took place at Valetta, Malta, upon the battleships *Nile* and *Collingwood*, of the Mediterranean fleet. The battleships rigged out their torpedo nets and made other preparations for defense, and masked all lights. A portable search light and two 3-pounder guns belonging to the *Vulcan* were placed to represent a battery on a point of land covering the approach to the anchorage. The *Astræa* took up a position nearly opposite the *Vulcan's* battery and represented another fort covering the approach. The attack was to be made between the two forts. The portable search light was fixed on a bearing to seaward and its beam was intersected by that of a fixed light from the *Astræa;* a belt of light thus was formed which the boats would be compelled to cross. Other search lights from the *Astræa* were used for sweeping. A single torpedo boat was allowed to be two minutes under fire before being considered out of action, an additional half minute being allowed for every other boat in company.

Five torpedo boats left the harbor during the afternoon with instructions to make the attack between 9 and 10.30 p. m. The sweeping lights failed to find them, and they were not seen until they entered the fixed sector. The torpedo boats attacked in two divisions of three and two boats, respectively. Had they attacked together they might have reached the *Nile* in the four minutes that would have been allowed them. As it was, in an effort to keep within the time allowed, the torpedoes were discharged in from two and one-half to three minutes at too great a range, not one of the torpedoes reaching the ship. Several torpedoes did not run, the tripper failing to act.

Under the rules the attack was a complete failure, but it is thought probable that a real attack would not be stopped in two minutes, as the boats presented what is designated as "a small and ghost-like target." The most important point to be considered is the failure of the sweeping lights to discover the boats, though this failure may be accounted for in part, perhaps, by the screen made by the fixed beams. On this point details are wanting.

COMMENTS.

The number of vessels taking part in the manœuvres of 1896 (105) was greater than at any time since 1890. More cruisers have been engaged several times, but the number of torpedo vessels and large torpedo boats, the so-called "destroyers," was greater than ever before.

The same objections are made each year to the mobilization. Within narrow limits the time is known and preparations are making for months before. From this point of view the time required to mobilize certainly is misleading, but there can be no doubt of the efficiency gained by the practical working out of the system. When a vessel has been repaired thoroughly and work on her is finished, the time of the year at which she is put in commission is not material.

The only valid objection to the English method of mobilization can be made not against the method itself, but against the system of "stealing" so prevalent among naval men whenever time can be gained.

If no preparations were permitted not embraced in the general scheme, the time test would be a fair one and war conditions would be approximated more nearly than they now are. The mobilization worked very smoothly, no hitch occurring either at commissioning, equipping, or leaving the yards. Evidently this part of the work is becoming more and more systematized each year.

There is a sameness about the preliminary drills and exercises inherent in the requirements. The efficient man-of-war, within her sphere, must develop "smartness" of officers and men. Clearing ship, man and arm boats, collision drill, general quarters, and other drills pertaining to a ship, as such, are matters of detail and practice; they correspond to the schools of the squad and company on shore. It is the same in a larger sense with the fleet tactics and evolutions. Here, however, the unit ship is part of the unit fleet, as a company of infantry is part of a battalion. It is superfluous to enter into the details of the preliminary work, for it was devoid of especial features and each year must be the same.

The problems set for the rival fleets were interesting. A fleet, the first part of which is ready for battle, and the second part preparing to reinforce the first part, is watching a fleet similarly divided. The first part of the home fleet is superior in force and speed to the first part of the hostile fleet; the second parts are equal, except that the home squadron is superior in speed. Superiority of power and speed is with the united home fleet as well.

From Bearhaven the hostile squadron is to be "gotten out" of Milford Haven—is to be brought to action and driven back. The squadron is not to be allowed to effect junction with the second hostile squadron organizing in Torbay. For forty-eight hours after the declaration of hostilities the second squadrons can not leave port, but the hostile commanders in chief do not know this until twenty-four hours have elapsed. Should junction be effected, the home fleet is to prevent the hostile fleet from entering Lough Swilly.

The language is plain enough, but the meaning is so far obscured that Vice-Admiral Kerr is said to have misunderstood entirely what was meant by the first phase. Apart from the physical movement it is hard to understand what is meant by "to get out" a squadron. C at anchor in a friendly port could remain there indefinitely so far as *A* was concerned. Fleet C at Milford Haven, watched by the cruisers and destroyers of Fleet *A*, which was lying in readiness at Bearhaven, was interpreted to mean that A could not pursue C until informed by scouts of C's movements. It is difficult to reconcile this interpretation with the objective of "getting C out" and defeating him. *A* knew there was a force D at Torbay, though not aware of its temporary immobility. He also knew, however, of an equal and friendly force at Kingstown. From Bearhaven to Milford Haven is 190 miles, which would require the scouts to steam 380 miles to convey any information. At 18 knots twenty-one hours would be consumed in this operation, making no allowance for time required to obtain accurate information. From Bearhaven to Lands End is 195 miles, and from Milford Haven to the same point is 105 miles. From Lands End to Torbay is also 105 miles. In other words, C was 85 miles nearer the point of greatest strategical importance.

Whatever meaning may be attached to the words "watched" and "lying in readiness," it is manifest that nothing possible to *A* can affect C, either as to "getting him out" or keeping him in. A fleet desirous of leaving a friendly port can do so at any time if the observing fleet is not actually present. The knowledge obtained by the observing fleet is dependent on the ability of the scouts to maintain touch; to do this they must be able to fight and to drive back the scouts and cruisers, trying to mask the real movement. In order, then, that an observing fleet can lie at anchor the scout force must be powerful enough to overpower the corresponding hostile force and numerous enough to send information without weakening itself to a dangerous degree.

If the home scouts do overpower the hostile force the latter can be reenforced by one or more of the battle fleet and the home cruisers driven off. This amounts to saying that observation to be effective must be blockade.

The only way "to get C out" was to remain at anchor; the only way to defeat C was to reach some point before him that he must pass. *A*, at 17 knots, was nearly twelve hours from Lands End, while C, at 12 knots, was only nine hours away; besides this the unknown D SQUADRON was distant only nine hours from the same point. The first part of the manœuvres appears to have been certain for C and impossible for *A*, for in the preliminary manœuvres *B*, as a factor, did not count. Even had Vice-Admiral Kerr put to sea at once he could not hope to catch C. This, however, does not excuse the failure of the *A* cruisers to obtain information and to convey it quickly to the commander in chief. The cruisers had between ten and twelve hours in which to reach Milford Haven before C could move. At their rated speed of 20 knots this was possible for the *Apollo*, *Naiad*, and *Sirius*, the First Division, but doubtful under service conditions. Still they could have discovered the departure of C not later than 2 a. m. From Milford to Kingstown is 103 miles, or, at 18 knots, six hours; from Milford Haven to Carnsore Point is 55 miles, or, at 18 knots, three hours. *A* should have known of C's escape not later than 9 a. m. July 25, whereas the information reached the admiral by way of Carnsore Point—Kingstown—Bearhaven at 3 p. m. At 1 a. m. July 25 the torpedo boat *Boxer* met *a squadron* in such a locality that it could be no other than SQUADRON C; in fact, the *Boxer* claimed to to have torpedoed the SULTAN, by name, yet this important information was not imparted until after it ceased to be of value.

Vice-Admiral Seymour acted throughout with admirable promptness. When hostilities were declared he was ready to go to sea, which he did literally "on the stroke of the bell," and effected junction in the shortest possible time.

At the beginning of hostilities the *A* scouts should have been off Milford Haven, where in time of war they undoubtedly would have been. The time given *A* was too short in which to take up the position of watcher. The fault lay in the preparation of the scheme and not in the execution of it.

Ignorant as he was of the movements of *B*, Vice-Admiral Seymour took every precaution to protect his right flank from sudden attack. St. Georges Channel was reconnoitered thoroughly before the battle fleet left Milford Haven.

For the first and second objectives success was with C.

Rear Admirals Powlett and Wilson seem to have misinterpreted their instructions. It is stated distinctly in the general scheme that "all ports used as bases for the fleets are torpedo-boat proof," yet elaborate preparations to resist attack were made and all hands were on the qui vive for nearly forty-eight hours.

Seventeen torpedo boats were employed protecting *B* at Kingstown, depriving the *Channel Fleet* of that much scouting force that easily could have reached Milford Haven before the departure of C.

The instructions given the C cruisers were complete: covering a front of 45 miles on a NW.-SE. line, they were to keep ahead of the battle fleet *and drive back the enemy's cruisers*. When Lands End would be reached the scouts and cruisers would remain to gather information.

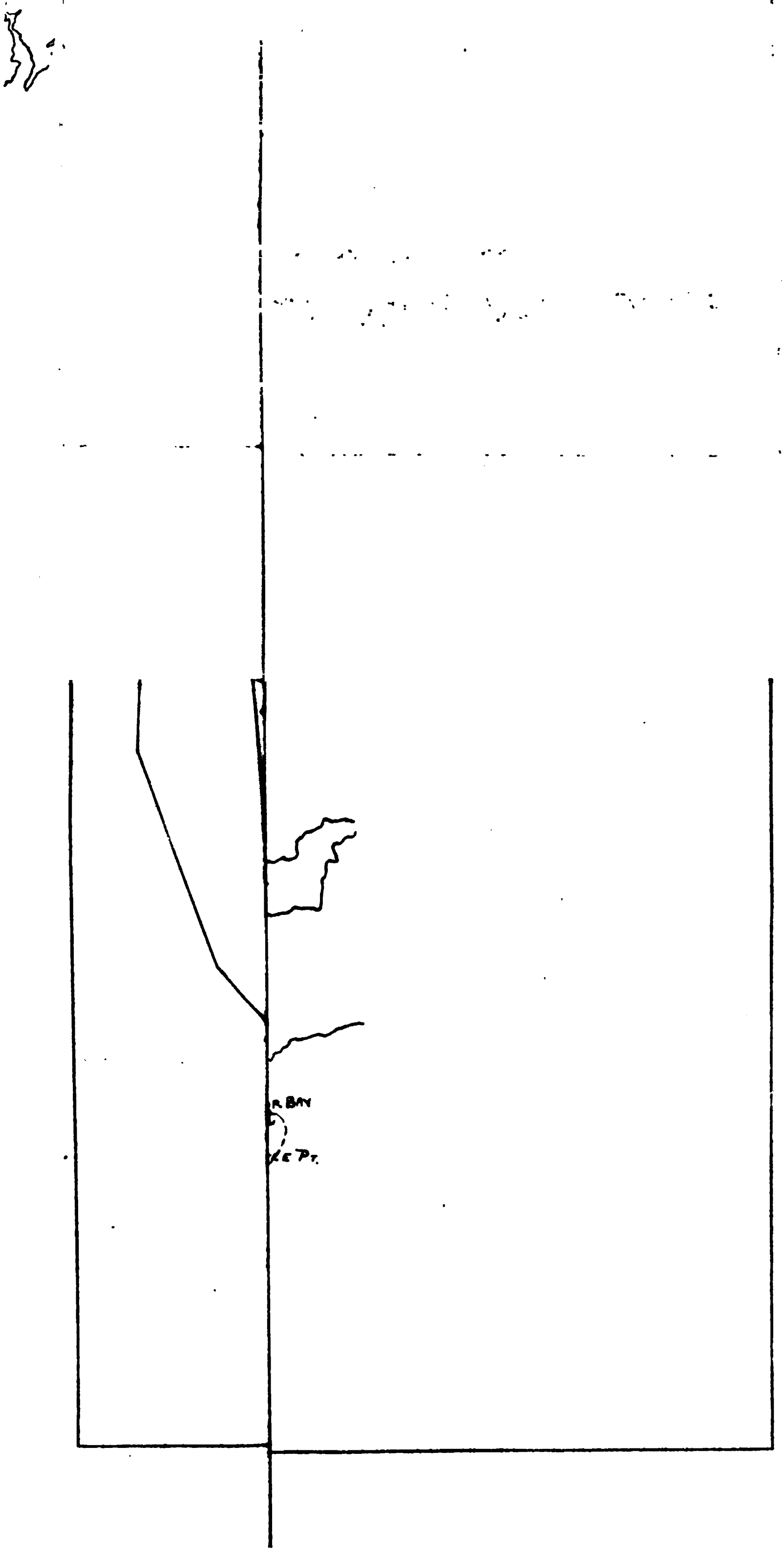
The second phase called for the attack and defeat of *A* by the RESERVE FLEET. At midnight July 25 Vice-Admiral Kerr knew that D SQUADRON could not leave Torbay before midnight July 26, and a position was taken up south of the Scillys, hoping to intercept C, but C at that time was safe in Torbay. *A* steered up and down the channel and returned to Lands End about 6 a. m. July 27. It was at this time Vice-Admiral Kerr received information of the junction of C and D. With his usual promptitude, Vice-Admiral Seymour was moving with his available force the instant the rules permitted. When the RESERVE FLEET was 20 miles from Scilly scouts reported *A* had been seen at 11 p. m. steering NW. from Scilly, so that the attempt to attack *A* was given up. At 7 a. m. the hostile squadron was about 30 miles distant (*see* chart), though *A's* superior speed would have enabled him to escape. The only method, apparently, by which *A* could have been brought to action and defeated would have been by allowing the RESERVE SQUADRON extra speed or by reducing *A's* speed temporarily under the rules, as was done in the French naval manœuvres of 1895 (p. 195, No. XV). With the escape (so called) of *A* the situation changed and the *Channel Squadron* became at once the superior. Vice-Admiral Seymour knew that the junction of *A* and *B* was assured and that they were somewhere to the northward of Lands End. Would Vice-Admiral Kerr attempt to block St. Georges Channel or would he make the best of his way to Lough Swilly? If the latter, how would he go? Would he go up the east coast of Ireland or the west coast? From Lands End to Lough Swilly by the east is 390 miles; by the west, 495 miles, of which 170 miles is the distance from Lands End to Cape Clear. Apparently the game was in the hands of the *Channel Fleet*. *B* came down the channel to meet *A*, and junction was effected about 2 p. m. July 27, at which time the RESERVE FLEET was standing for Lands End. The AUSTRALIA, cruiser, was captured about this time, but she had succeeded in getting word to Sennen Cove of *A's* movements that morning. With her capture all aggressive action on the part of *Channel Fleet* cruisers appears to have ceased, and until the RESERVE FLEET was steaming into Lough Swilly no definite reports of its movements reached Vice-Admiral Kerr. From July 26 until the morning of July 30 not a hostile cruiser had been seen by the battleships of the RESERVE FLEET, yet there were nineteen cruisers and torpedo vessels and twenty torpedo boats trying to find them. Standing to the southward and westward after passing the Scilly Islands a second time Vice-Admiral Seymour, following out a course of reasoning closely corresponding with Vice-Admiral Kerr's movements, headed up to round Cape Clear, but well to the southward. The *Channel Fleet* reached the cape about 8 p. m. July 27, and extended search about 20 miles to the southward. Night lookout is difficult at best, and the range of observation could not have extended over a mile beyond the most distant vessel. It was not until twelve hours later that the RESERVE FLEET passed the cape 100 miles to the southward. Two considerations evidently infleunced Vice-Admiral Kerr in the course taken by him—first, he avoided a long stretch of hostile coast infested by torpedo boats, and, secondly, he obtained two chances to catch the RESERVE FLEET, one at Cape Clear and the other at Lough Swilly. The *Channel Fleet* reached Lough Swilly at midnight July 28, and hostilities were not to cease until 8 a. m. July 30. It is well to notice the remarkable performance of the *Channel Fleet* in steaming a distance of nearly 500 miles at an average speed of nearly 14 knots.

The RESERVE FLEET reached the rendezvous with ten hours to spare in which to reach harbor after a run of 70 miles to be made in thick weather. The harbor was reached and the *Channel Fleet* eluded.

This rapid résumé, even at the risk of repetition, is necessary to a proper understanding of the conditions.

At first sight the advantage rested with the *Channel Fleet*, and the task set the RESERVE FLEET was impossible. With speed, power, homogeneity, and numbers against him, not to speak of the advantage of situation, Vice-Admiral Seymour was presumed crushed before the strategical exercises began. This was not so. Either intentionally or by error the first tasks set Vice-Admiral Kerr were impossible, as already has been shown. The capture of the *A Squadron* by the RESERVE FLEET was equally impossible, so that it would seem as if the conditions required amounted only to this, that a larger and faster fleet is to attempt to prevent a weaker and slower fleet from entering a certain harbor within a certain time. This was not done, and great credit is due Vice-Admiral Seymour for his success, but the conclusions drawn by the English press seem to be hasty and ill considered. Vice-Admiral Kerr was fifty-six hours in a dangerous situation, with a large fleet of heavy armored vessels. It is one thing to remain at such a post in time of war, but a very different thing in naval manœuvres. Many a man will take risks in war that in peace he would regard as foolhardy. As stated by the late Vice-Admiral Tryon, "Risks that are not only justifiable, but are demanded during war, are not justifiable during peace." Without great risk the ships could not be kept close up at night, particularly during thick weather. The terrible effects produced by a collision in fog between the vessels of two such fleets readily can be imagined. Fortune favored the RESERVE FLEET, and it approached from the westward when the *Channel Fleet* was at the extreme eastern end of the patrol ground and farthest at sea. Neither fleet saw the other until one was safe from pursuit. To say this establishes the principle that a fleet can enter any port at any time in the face of a superior enemy can not be true; no principle can be established by a series of fortuitous circumstances occurring also under special conditions. Undoubtedly, however, the personal factor enters. It is unquestionable that the success of the RESERVE FLEET was due partly to the assumption of risk and responsibility by Vice-Admiral Seymour, abundantly justified by the landfall made after a run in fog and darkness.

Under the "meeting" rules the *Channel Fleet*, to be successful, had to meet the RESERVE FLEET at least 20 miles from Lough Swilly and remain within 3 miles of it for at least two hours. Of course, such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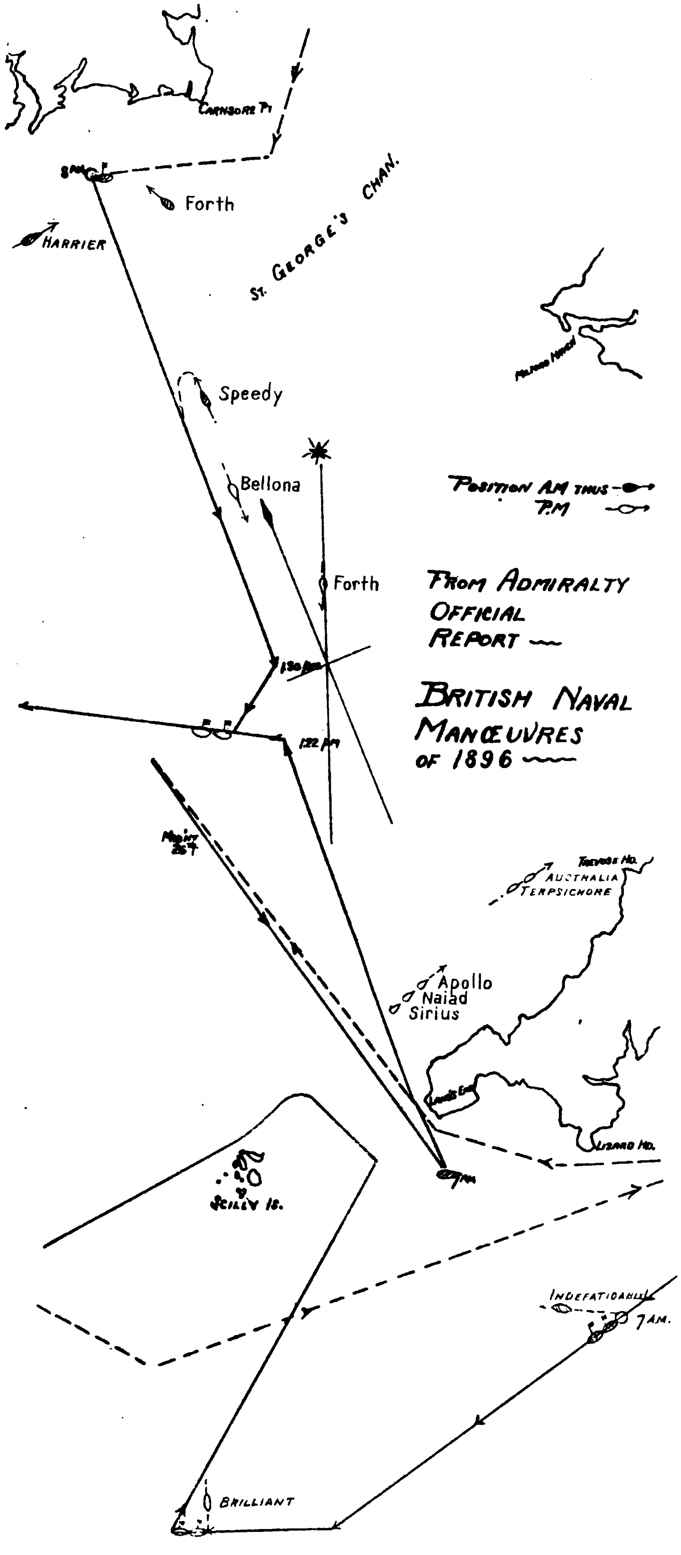


From Admiralty Official Report —

British Naval Manœuvres of 1896

The fleet returned to Toulon, where the vessels moored about 4 p. m.

The following was the composition of the RESERVE FLEET:

Vice-Admiral Cavelier de Cuverville, commander in chief.

Battleships: First division—AMIRAL DUPERRE (flag), CAÏMAN. Second division—FRIEDLAND (flag of Rear-Admiral de Beauregard), TERRIBLE.

Cruisers: First division—CECILLE, LALANDE, LEGER. Second division—SFAX, MILAN.

Torpedo boats: First group—AUDACIEUX, AVENTURIER. Second group—ORAGE, CHEVALIER.

RESERVE FLEET.—The fleet, under the command of Vice-Admiral Cavelier de Cuverville, bombarded Ajaccio, defended by the batteries and mobile defenses. The battery and semaphore forces were doubled. While steaming toward Ajaccio during the night of July 9 and 10, the torpedo boat AUDACIEUX was sunk by collision with the CHEVALIER: (*See* Casualties p. 123.) The fleet was steaming without lights, but the AUDACIEUX carried hers. The CHEVALIER was unable to reduce speed to that of the fleet and had permission to circle about so as not to leave the fleet. She carried no lights, as she should have done, not being included in the squadron formation. To this fact may be attributed the accident. No lives were lost, as the AUDACIEUX was kept afloat about three hours. The exercises of the RESERVE FLEET were similar, generally, to those already described. The fleet anchored each night at Ajaccio.

July 14, the national fête day, was passed at anchor by the two fleets in Toulon and Ajaccio, respectively.

SECOND PERIOD.

Active Fleet.—July 15 the fleet in two divisions weighed early in the morning. The first division was composed of the Active Squadron under Vice-Admiral Gervais. The second division was made up of the War College division, with the *Bugeaud* added, under Rear-Admiral Fournier. The first division anchored at Hyères Roads, after spending the greater part of the day in torpedo exercises very similar to those previously described. The force attacked was composed of the *Magenta*, *Redoutable*, *Devastation*, and *Courbet.* Both squadrons advanced in column of vessels and passed to starboard of each other. When the heads of columns came abeam the torpedo boats, previously massed to starboard of the friendly battleships, quickened speed and, turning to starboard, circled around to pass close astern of the *Amiral Baudin*, the rear vessel of their own column, attacked in succession from the head of column. Nearly all the torpedoes struck. Later the same day the torpedo boats of the Toulon mobile defense attacked the armored ships, and again that night after the fleet anchored in Port Pothuau. July 16 was spent in somewhat similar exercises by the armored ships, and also in efforts to board. A platform was towed at a speed of 10 knots, and the vessels approached it near enough to throw grappling irons. The *Casabianca* and *D'Iberville*, at 13 knots, attempted to force a blockade and escape, while eight torpedo boats of the Toulon force, speed 15 knots, succeeded in preventing their escape. At 9 p. m. the light division rejoined.

RESERVE FLEET.—July 15–17 the fleet was occupied with various exercises, including torpedo boat attacks. The LALANDE was the only vessel struck.

Combined fleets.—The following theme indicates the operations completing the second period.

A squadron *A* anchored at Salines-d'Hyères learns that a stronger squadron E is cruising in that part of the Mediterranean included between Corsica, the Balearic Islands, and Provence. By means of semaphores *A* succeeds in calling a friendly squadron *B*, also weaker than E, to his assistance. *B* is anchored at Ajaccio. *A* and *B* united are superior to E. *A* and *B* are to effect junction. *A* is to try not to lose touch with E and also to open communication with *B* by means of his cruisers. The following was the composition of the squadrons:

A (Hyères): ***Brennus*** (Vice-Admiral Gervais), ***Marceau***, ***Amiral Baudin***, battleships; ***Charner***, ***Latouche-Tréville***, ***Chanzy***, ***Bugeaud***, ***Troude***, ***Wattignies***, cruisers; ***D'Iberville***, ***Casabianca***, torpedo vessels; ***Filibustier***, ***Tourmente***, torpedo boats.

B (Ajaccio): ***Amiral Duperré*** (Vice-Admiral de Cuverville), ***Caïman***, ***Terrible***, battleships; ***Cécille***, ***Sfax***, ***Lalande***, cruisers; ***Lger***, torpedo vessel; ***Orage***, torpedo boat; absent, ***Friedland***, battleship, machinery out of order; ***Milan***, cruiser, convoying the torpedo boat ***Chevalier*** to Toulon, and ***Audacieux*** lost.

E: MAGENTA (Rear-Admiral de Slane), REDOUTABLE, DÉVASTATION (Rear-Admiral Pottier), COURBET, battleships; FANCON, VANTOUR, cruisers; AVENTURIER, ECLAIR, KABYLE, SARRAZIN, torpedo boats.

SQUADRON E weighed from Salines-d'Hyères July 17 at 10.15 a. m., and disappeared to the southward. About noon the Porguerolles semaphore signaled the enemy in sight, whereupon the cruisers of *A* were sent to sea, separating in the offing into two divisions, all the larger and stronger vessels into one, destined to preserve contact with the enemy and capable of driving in the E cruisers; the other composed of the lighter and faster vessels, to obtain touch with *Squadron B;* the *Casabianca* was attached as dispatch vessel to the first division and the *Wattignies* remained with the armored force. At 1.20 the ***Brennus***, ***Marceau***, ***Baudin***, and ***Wattignies*** weighed, with the ***D'Iberville***, ***Filibustier***, and *Tourmente* in company. *Squadron B* weighed from Ajaccio about the same time. July 18 at daylight the three squadrons were in sight. *A* and *B* united and attacked E, while the united cruisers chased the enemy's cruisers. While urging the fires the ***Filibustier's*** water guages blew out, mortally wounding one man and severely wounding two others. After an action the squadrons separated again to carry out a new program. *Squadron A* undertook the defense of the coast of Provence. E, operating within the sector previously mentioned, discovered *A* and blockaded him. *A* was enabled to inform *B* of the situation, and the blockade was broken by the combined operations of the two squadrons. *A's* cruisers were especially active. July 20 operations ceased and the vessels separated to take in stores, part going to Algiers and the rest, twenty vessels, to Philippeville. The port was found to be too small an anchorage even for this comparatively small force; as a consequence, part of the fleet went to Bona, others waited at Stora until room was made for them in the harbor of Philippeville. July 21 the *Chéliff* and four torpedo boats of the Bona mobile defense reached Philippeville and were placed under the orders of Vice-Admiral Gervais.

THIRD PERIOD.

For the third period the fleet was organized as follows:

Fleet A.—First division: *Brennus* (Vice-Admiral Gervais), *Marceau*, *Baudin*, *Charuer* (Rear-Admiral Fournier), *Bugeaud*, *Troude*, *Wattizne*, *D'Iberville*, *Filibustier*, *Eclair*, *Agile*. Second division: *Dévastation* (Rear-Admiral Pottier), *Courbet*, *Redoutable*, *Latouche-Tréville*, *Suchet*, *Faucon*, *Casabianca*, *Sarrazin*, *Tourmente*, *Aventurier*.

FLEET B.—First division: AMIRAL DUPERRÉ (Vice-Admiral de Caverville), TERRIBLE, CAÏMAN, CÉCILLE, SFAX, MILAN, LEGER, ORAGE. Second division: MAGENTA (Rear-Admiral de Slane), NEPTUNE, CHANZY, LALANDE, VAUTOUR, KABYLE.

Fleet A united at Bougie, from which place it weighed July 25 to carry out the program.

FLEET B was at Algiers, from which port the second division got under way first.

THEME.

Fleet A is a French fleet anchored in Bougie. The French coast is defended by the mobile defense vessels of Toulon and Corsica while news is sent *A* of an attack. FLEET B is hostile, with headquarters at Algiers. The west coast to Morocco is enemy's territory; the rest of the coast is French, as is also the coast of Provence. B is to attack and bombard the French coast, to destroy commercial centers, and to remove semaphores. *A* is to find and attack B, to destroy him if possible. The mobile defense is to patrol the coast, but not to put to sea. Finally, B is to bombard the eastern coast of Algiers. The fleets unite and carry out a combined attack on the coasts of Corsica and Provence.

EXECUTION.

When hostilities were declared the fast battleships MAGENTA and NEPTUNE, with the cruisers SFAX and VANTOUR, under the command of Rear-Admiral de Slane, started for the coast of Provence, the main body of B following toward the Balearic Islands, the idea being to draw *A* over to the French Coast. The effort was partially successful, as the fast *A* cruisers *Amiral Charner*, *Latouche-Tréville*, and *Suchet*, under Rear-Admiral Fournier, followed in the endeavor to ascertain the position and movements of the enemy. An attack was made on Toulon, but the enemy was driven off by the mobile defense. The Garoupe semaphore was seized, however, by the SFAX, while the MAGENTA bombarded Fort Mont-Boron, near Nice, and repulsed attacks by torpedo boats Nos. **27**, **64**, **104**, **134**, and **177**, defending the Villefranche sector. During one of the attacks a force was landed to simulate the destruction of signal stations. The armored vessels protected the landing and the mobile defense was compelled to scatter. The *Suchet* narrowly escaped capture and the light division, unable to interfere with the enemy's movements, rejoined the *A Fleet.* In the meantime Vice-Admiral Gervais sent the *Redoutable* and *Bugeaud* to destroy the coaling station at Dellys. It was assumed the port was destroyed after about two hours' fighting, the *Redoutable* losing two-thirds of her fighting value. B suffered a reduction of fighting value in the attacks along the French Coast. B was further reduced by slight injuries to the AZILE, KABYLE, and ORAGE, torpedo boats that were conveyed to Algiers by the LEGER.

A Fleet seems to have remained on the Algerian Coast during the rest of the operations. The main force of the B FLEET cruised for five days in the neighborhood of the Balearic Islands. During the first day the *A* cruisers were seen, but no meeting took place between the fleets. Coal was running short in the B FLEET, and as the only coaling station belonging to the fleet was adjudged destroyed, B was considered defeated in spite of the successful raid along the coast.

July 30 B FLEET united and made an attack in the neighborhood of Gien. At 11 a. m. the vessels hauled off and anchored at Salins-d'Hyères during the afternoon. The *Amiral Charner* took part in one of the attacks and succeeded in breaking the line of defense and entering Toulon Harbor.

The same day the *Active Squadron* concentrated at Philippeville and weighed that evening for Toulon. The *Wattignies* and *Fancon* remained with the torpedo boats to obtain a night's rest for the crews, and got under way the following morning.

The *Bugeaud*, having aboard the *réservistes*, was sent ahead and reached Toulon the morning of August 1. B FLEET arrived next from Salins-d'Hyères and *A* the same afternoon. After a congratulatory order from Vice-Admiral Gervais the manœuvres terminated.

CASUALTIES.

July 10: AUDACIEUX, torpedo boat, sunk by collision with the CHEVALIER, torpedo boat. While the RESERVE FLEET was steaming toward Ajaccio, orders were given to mask all lights. The AUDACIEUX, carrying her running lights, was detailed by the admiral to inspect the fleet during the night, and to report upon the visibility of the vessels, and presumably of any lights. The CHEVALIER was unable to keep station at the slow speed of the fleet, and the commanding officer had obtained permission to increase speed and to fall out of the fleet formation. In order not to leave the fleet the CHEVALIER circled about, but by some oversight failed to carry her running lights. While making the second round of the fleet, and ignorant of the status of the CHEVALIER, the commanding officer of the AUDACIEUX suddenly made out a vessel close aboard crossing his bows. He reversed at full speed, but the distance was too small, and the bows of the AUDACIEUX struck the CHEVALIER near the bow. The latter was so slightly damaged, although the vessel struck, that she was kept afloat and reached Ajaccio unaided, convoyed by the MILAN. Later, she was sent to Toulon for repairs. Every precaution was taken to save the AUDACIEUX; bilge pumps started, collision mat put over the bows, etc., but to no purpose. The forward parts had been crushed and the bulkheads forced in, more than half the boat being open to the sea. The SFAX took her in tow by the stern, hoping to reach Ajaccio, but at 5.15 it became necessary to abandon her; the tow line was cut and the boat sank. No lives were lost.

July 17: CHEVALIER, torpedo boat, conveyed by MILAN, cruiser, arrived at Toulon. MILAN, cruiser, injury to boiler on passage; repaired at Toulon. A detonator exploded while he was handling it, injuring one eye and one hand of Ensign Doue, of the MILAN. He was sent to the Toulon hospital, where he recovered.

July 18: FILIBUSTIER, torpedo boat, blew out water guage, mortally wounding one man and seriously injuring two others. The men were transferred to the BRENNNS, where the first man died; the others were landed at the Philippeville hospital.

July 19: FRIEDLAND, battleship, injury to starting engine. This was the third time since the beginning of the manœuvres that defects developed aboard this vessel. She was sent to Toulon and replaced by the *Neptune*.

July 21: *Magenta*, battleship, when mooring in the harbor of Algiers the mooring chain broke, and the high wind blowing at the time forced her stern upon Nameless Rock. She was gotten off without material injury, after lightering part of her coal.

July 25 an officer of the *Amiral Baudin*, battleship, committed suicide.

July 27: AZILE, KABYLE, and ORAGE, slight injuries to machinery; were sent to Algiers; convoyed by torpedo vessel *Leger;* all rejoined at Salins-d'Hyères July 30.

COMMENTS.

No complaints seem to have been made about the *réservistes*. As far as known they were punctual, and performed the duties required of them satisfactorily. The movements of the various squadrons preparing for the manœuvres called forth no unfavorable criticism.

Restricted as is the area in which manœuvres can be held, a sameness and a certain amount of repetition can not be avoided. The first period in French manœuvres differs from the English preliminary work, as the "shaking down" required is less. Ships are not newly commissioned, and the nature of the work required of them is more exterior than interior.

In the Active Fleet the feature of the drill undoubtedly was the fleet torpedo-boat attack. This resembled real war more closely than any exercise of the kind attempted by French vessels. Many torpedoes were said to have struck. It is to be regretted so many details are wanting, particularly the amount of protection afforded the boats by their armored vessels; the distance between squadrons when the attacking force changed course; whether the boats attacked in succession as the squadron uncovered them, or after the rear ship had cleared the enemy's front; whether they did or did not steam through the intervals between ships, just before or just after the change of course; and finally, how long the boats were considered to be under fire. The only criticism is as to the advisability of line attack; but this formation presumably was taken to develop the torpedo-boat attack and not through tactical considerations. The coast attacks and other exercises call for no especial remarks.

During the second period an attack in column took place. Here the boats were better protected, but during the approach would have been visible to the enemy, who naturally would not have maintained a parallel course unless himself accompanied by a corresponding flotilla. Here again details are wanting, and the same questions as above can be asked. One can draw the conclusion, however, from these exercises that the French torpedoes are well regulated and particularly well handled. Great and lasting improvement has been noticed in these important particulars, rendering the torpedo more certain in its action and correspondingly more formidable. The closing exercises of the second period demonstrated the importance of powerful cruisers. The *A* cruisers rendered those of the *B* squadron practically useless. They were compelled to remain near the battleships, and *A* could not be shaken off. Speed and offensive power must both exist in the cruiser force or it is almost valueless.

In view of the meager information obtained regarding the third period, an intelligent criticism is almost impossible. If the theme is given correctly the action of the main forces can not be explained. If B was going to attack either Provence or the French Coast (so called) of Algeria, what was gained by a five-days' disappearance among the Balaeric Islands, burning coal and hurting no one? If *A* was to find B and defeat him, or if *A* was to defend Provence, why did not he go there?

What strategical considerations governed so able a leader as Vice-Admiral Gervais as to permit the destruction of much valuable property, railroad communications, and military works? Why was the cruiser force sent out by *A* so weak as to be unable to cope with the raiding force of B? It does not appear that a successful search was made for the main B force, and the only explanation given is that the cruisers could not cover the manœuvre field. If Dellys was so weak as to fall before the attack of one battleship and cruiser, the B force risked itself by abandoning its only coal depot. The ulterior object of *A* was of course the destruction of the enemy's fleet, and this virtually was accomplished when B lost Dellys; but a fleet so situated would sell itself dearly, or at least attempt to retake its base. In real warfare a fleet without a coal depot is not thereby reduced to helplessness, for colliers may coal it, and coal can be captured both ashore and afloat. No effort of this kind seems to have been attempted by B. Vessels like the *Suchet*, *Troude*, and LALANDE showed efficiency and that they are of a good type; but the larger vessels of the *Chanzy* type showed want of coal capacity and want of speed for vessels of such size. The *Chanzy*, after three days' steaming, at a speed near 16 knots, ceases to be a rapid cruiser. She is rated at near 18 knots. The armored vessels and the seagoing torpedo boats showed themselves excellent and seaworthy.

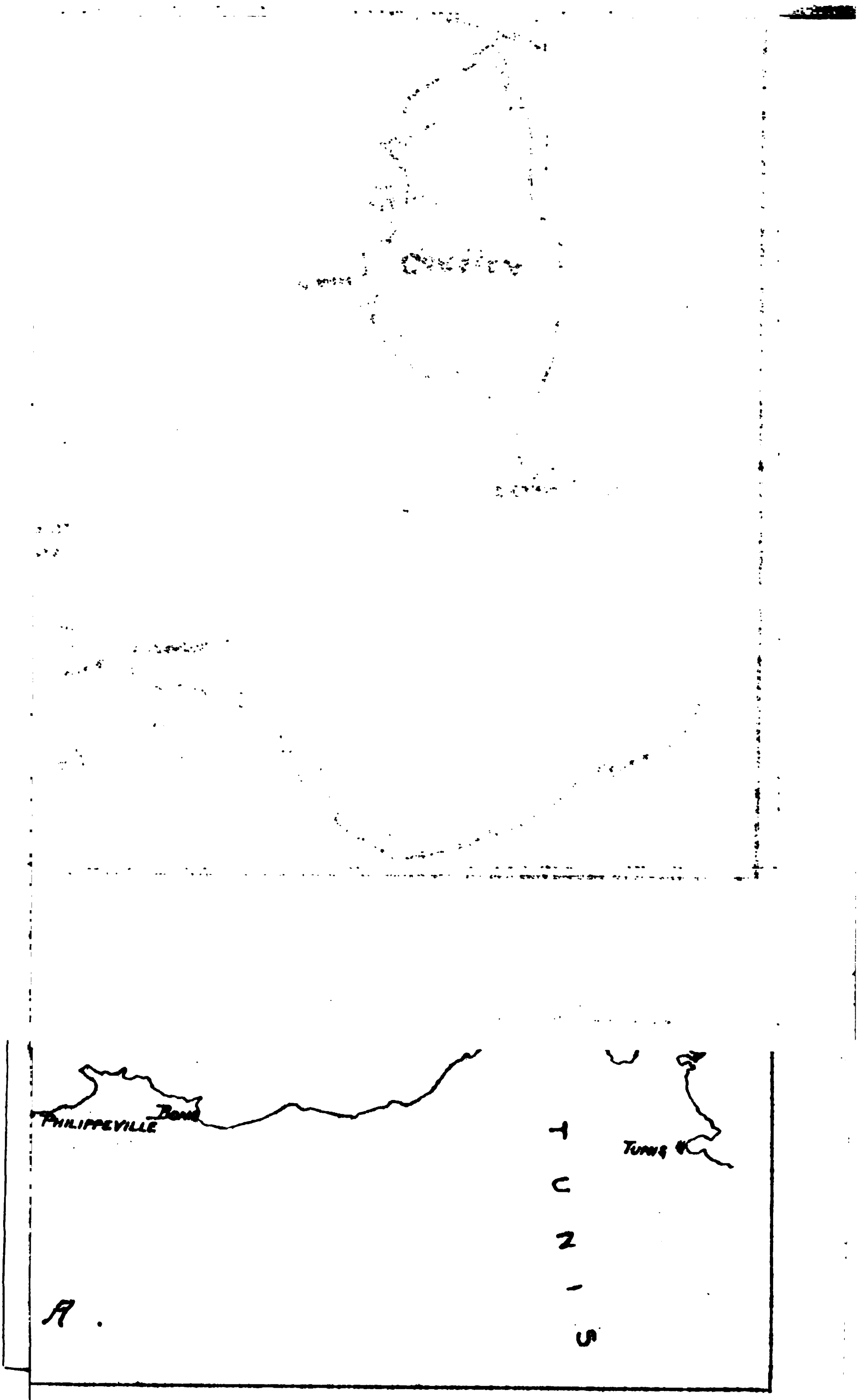
Everything points to a high state of efficiency in the Mediterranean fleet both as to material and personnel. The small number of casualties and want of hostile criticism in a usually hostile press speak volumes in this regard. Much also may be attributed to a thoroughly practical system of drills and exercises, devised and carried out under the direction of one of the most capable officers afloat.

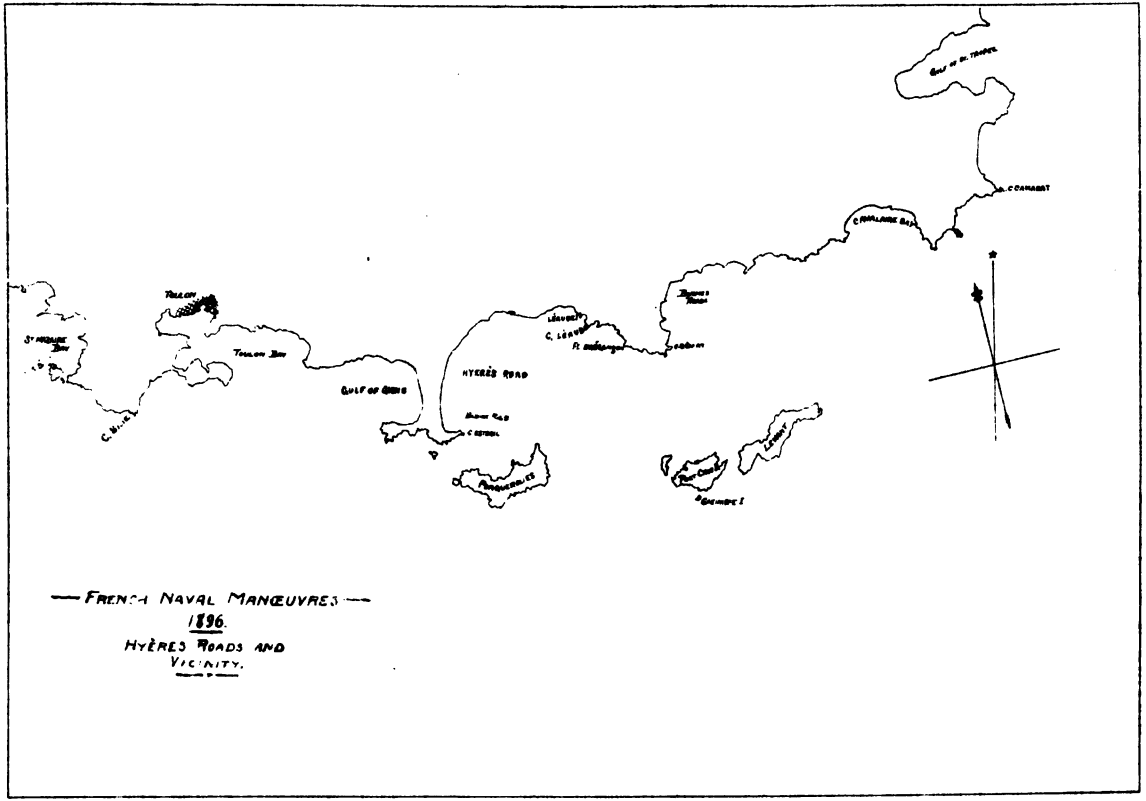
ADDITIONAL.

Experiments were conducted during August to test the practicability of coaling at sea by means of the Temperley transporter. The *Lutécia*, of Marseilles, was loaded with 250 tons of coal in sacks and 250 tons in bulk. The result of these experiments is not known. Coaling at sea is one of the most important problems awaiting solution. When, within reasonable limits, this operation can be carried on without regard to wind and weather, the efficiency of a fleet will be enormously increased.

During one of the torpedo-boat exercises the *Sarrazin* attempted to torpedo the *Neptune* while at anchor in Hyères Roads. The *Sarrazin* was discovered in time and kept under the rays of the electric light. Those directing the movements of the *Sarrazin* were dazzled and lost all appreciation of distance, so that the torpedo boat ran directly into the *Neptune*. Fortunately but little damage was done. This is but one of many instances showing the blinding power of search lights and its effect at critical moments upon the efficiency of torpedo boats.

August 17, during rapid-fire target practice, at a towed target, Lieutenant Le Tiec of the cruiser *Vautour* detected Gun Captain Delahaye firing not at the target, but at the bridge of the battleship *Brennus*. The man claimed in his defense that for the moment he forgot he was using ball cartridge and that unthinkingly he had aimed as in


PHILIPPEVILLE
Bone
TUNIS
TUNIS
A.



—— FRENCH NAVAL MANŒUVRES ——

1896.

HYÈRES ROADS AND VICINITY.

the usual daily exercises. He fired before being stopped about twelve shots, of which at 700 meters (765 yards) five or six struck. One man was wounded. No criminal intent existed. Great care was ordered exercised in consequence during target firing. The man was sentenced to fifteen days' confinement and deprived of his position of gun captain.

September 10 experiments were made in the Gulf of Jouan with a countermine called the "submarine sentinel." Towed by the *Sarrazin*, the apparatus succeeded in exploding two automatic torpedoes previously anchored. A favorable report was made.

October 14 Vice-Admiral Gervais was relieved of the command of the *Active Fleet* by Vice-Admiral Cuverville and Vice-Admiral Humann took command of the RESERVE FLEET.

Throughout the winter exercises took place at frequent intervals. In December the RESERVE FLEET began night movements without lights, an exercise largely developed under the command of Rear-Admiral Gervais. Entering Hyères Roads without lights, by the little pass, one of the many torpedo-boat attacks was delivered. Getting under way and anchoring at night without lights frequently was practiced.

February 6 the RESERVE FLEET began the execution of a strategical problem set by the commander in chief. The fleet got under way just after nightfall, according to custom, whenever possible. The following is the theme set:

War has been declared most unexpectedly. The *Active Fleet* has weighed immediately for the east, and the RESERVE is to cover and defend the littoral between Toulon and Marseilles. A large hostile force, cruising to the southward of the Balearic Islands, sends the cruisers and torpedo vessels to raid the Provence Coast. The RESERVE must find the cruisers, at the same time guarding against the torpedo vessels that are to be fought and captured. Junction later is to be made with the *Active Fleet*, which has stationed a few videttes, as a sort of rear guard, on the Corsican Coast.

The three principal points brought out by this theme in its practical application were as follows:

(1) Contact with a hostile force represented by mail boats known to have left Algeria about the proper time.

(2) Guarding against torpedo-boat attack, and attempt to capture the boats. The mobile defense of Toulon represented the hostile flotilla, and was kept in ignorance of the whereabouts of the fleet. The flotilla was allowed sixty hours to find the fleet between Toulon and Marseilles, keeping north of the parallel of Porquerolles.

(3) Concentration, then fan-shaped deployment, limited only by ability to read long-distance signals, trying to find the rear guard of the *Active Fleet.* The battle squadron, under Vice-Admiral Humann, consisted of the AMIRAL DUPERRÉ, TERRIBLE, and CAÏMAN, with the torpedo boats ORAGE and AVENTURIER The light squadron, under Rear-Admiral Godin, consisted of the cruisers CHANZY, LATOUCHE-TRÉVILLE, and MILAN.

Work of this kind has demonstrated the usefulness of the **Reserve Fleet**, and has stilled the cry lately raised to abolish it. In view of the present political complications in the East, the theme selected was eminently practical. It is to be regretted so little is known of the details of execution.

THE GERMAN MANŒUVRES.

The period covered by the German manœuvres and tactical exercises extended from August 9 to September 14. The vessels assembled at Wilhelmshaven. Admiral Knorr, in command of the naval department, hoisted his flag aboard the *Blücher* as commander in chief; Rear-Admiral von Diederichs was chief of staff, and assisted by a captain and two commanders.

The following program was issued concerning the manœuvres: August 10 and 11, inspection by the commander in chief; in the evening to weigh, and to manœuvre for two days between Helgoland and the mouth of the Elbe. August 14 the entire fleet to make the passage through the Kaiser Wilhelm Canal to Kiel. To manœuvre in the Baltic until September 2, and then to return by the Big and Little Belts to the North Sea, where the manœuvres will be completed in presence of the Emperor, in the area comprised between Helgoland and the mouths of the Elbe and Jahde. September 12 return to Wilhelmshaven and inspection.

The following-named vessels took part in the manœuvres:

Admiral Knorr, commander in chief.

Ship.	Class.	Station.	Date of completion.	Displacement.	Guns, main battery.	Maximum speed.	Complement.
				Tons.		*Knots.*	
Blücher (flag)	Training ship	Training	1877	2,856	2 boat	14	400
First fleet.							
First division, Vice-Admiral Koster.							
Kurfürst Friedrich Wilhelm (flag).	Battleship, first class	Active	1891	10,033	12	16	556
Brandenburg	do	do	1891	10,033	12	16	556
Weissenburg	do	do	1891	10,033	12	16	556
Wörth	do	do	1892	10,033	12	16	556
Jagd	Protected cruiser, third class.	do	1888	1,250	4	19	140
Second division, Rear Admiral Arnim.							
König Wilhelm (flag)	Battleship, second class	do	1868 1896	9,757	29	19	730
Sachsen	do	do	1877 1896	7,400	6	14	377
Württemberg	do	do	1878 1896	7,400	6	14	377
Hagen	Coast defense, battleship	do	1893	3,495	11	15.5	266
Wacht	Protected cruiser, third class.	do	1887	1,240	4	19.6	140

Admiral Knorr, commander in chief—Continued.

Ship.	Class.	Station.	Date of completion.	Displacement.	Guns, main battery.	Maximum speed.	Complement.
Torpedo flotilla.							
Commander Poschmarm.				*Tons.*		*Knots.*	
Blitz	Gun vessel	Active	1882	1,382	6	16	134
D 7	Torpedo vessel divisional	do	1890	350	3	26	70
D 9	do	do	1894	380	3	26	70
Twelve torpedo boats		do					
Second Fleet.							
Third division, Rear-Admiral Barandon.							
Stein (flag)	Training ship	Instructional	1879	2,856	14	13	446
Stosch	do	do	1877	2,856	14	13	446
Moltke	do	do	1877	2,856	14	13	461
Gneisenau	do	do	1879	2,856	14	13	461
Grille	Surveying vessel	Survey	1857	350	6–1 pr R. C.	13	74
Fourth division, Captain Koch.							
Hildebrand	Coast-defense battleship	Coast defense	1892	3,495	11	15.5	266
Siegfried	do	do	1889	3,495	9	15.5	266
Frithjof	do	do	1891	3,495	11	15.5	266
Beowulf	do	do	1890	3,495	11	15.5	266
Torpedo Flotilla, Captain Colomb.							
D3	Torpedo boats, divisional	Coast defense	1888	300	*Tubes.* 3	21	50
D5	do	do	1888	300	3	21	50
D6	do	do	1888 1889	320	3	23	50
Twelve torpedo boats		do					
Pelican	Transport and storeship	Special	1890	2,000	8	16	182

The manœuvres present no special features; interest centers chiefly in the passage of the Kaiser Wilhelm Canal and the strategical importance resulting therefrom.

October 1, 1887, the corner stone of the canal was laid by Kaiser Wilhelm I. The canal was declared open officially June 1, 1895. No difference of level was to be expected in the canal, but winds and the tides in the river Elbe necessitated a lock near Brunsbüttel, at the Elbe entrance, and another near Holtenau, at the Baltic entrance. These locks are each 492 feet long, 82 feet wide, and 31.3 feet deep. The canal begins at a distance of about 2.5 kilometers (1.5 miles) to the eastward of Brunsbüttel and runs in a general northeasterly direction, and terminates about 5 kilometers (3.1 miles) above Kiel. The length of the canal is 61.3 miles; width, 65.6 meters (215.2 feet); for a width of 20.94 meters (68.70 feet) the depth is 9.30 meters (30.51 feet); thence to a width of 40 meters (131.2 feet) the depth decreases gradually to 6.30 meters (20.67 feet). The Kiel mouth is about 28.5 miles north of the Elbe mouth. At Brunsbüttel is an outer harbor 1,512 feet long by

328 feet wide. Kiel Harbor is about 6 miles in length and 1¼ miles in width, with a depth of water from 30 to 50 feet.

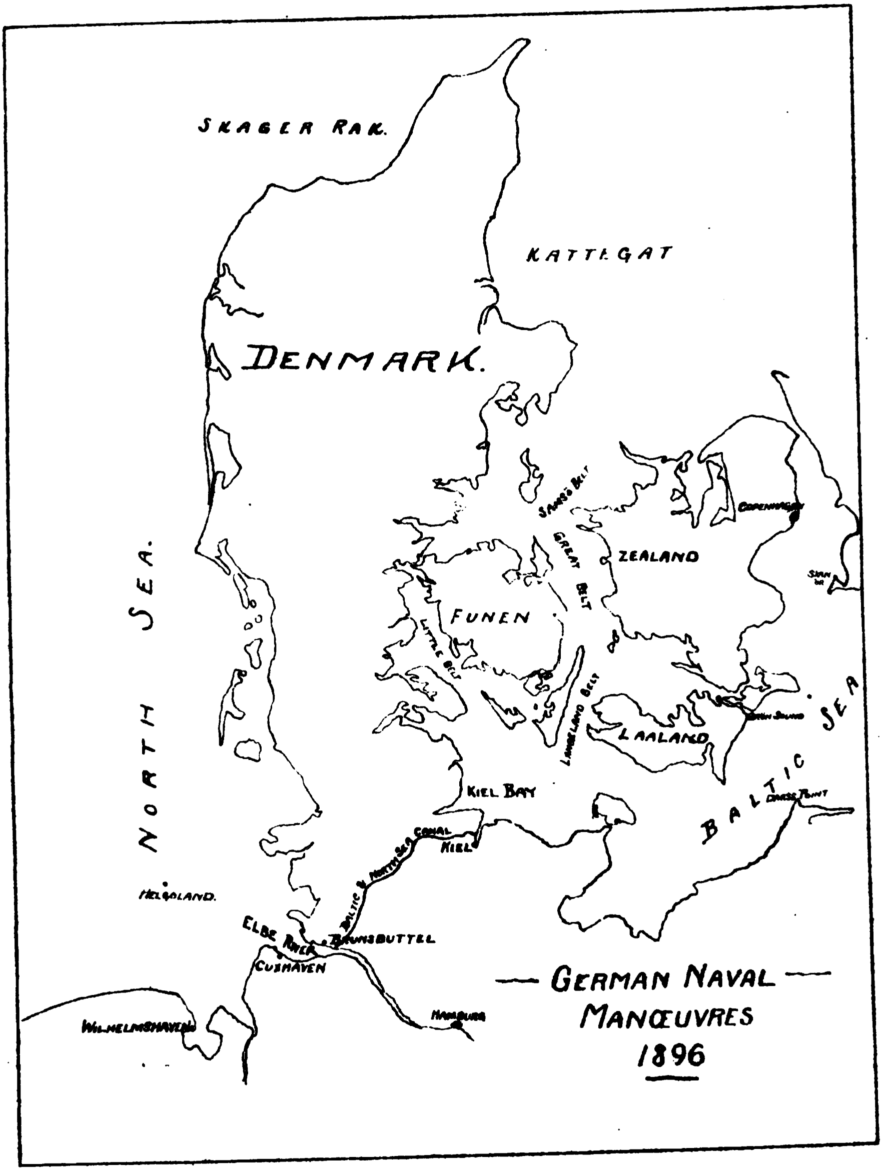
The canal is crossed by two bridges, 137 feet above the water, and six drawbridges. There are six turnouts and sixteen ferries. The cost of the completed canal was a little more than $39,000,000.

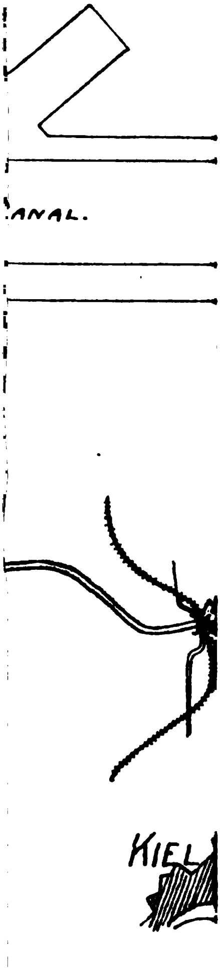
The passage of the canal took place August 13 and 14, beginning at 1 p. m. August 13. The times through the locks were as follows: One torpedo boat was locked through in seven minutes, fourteen boats (two divisional and twelve torpedo boats) in ten minutes, two battleships in fifteen minutes. At night the times were slightly increased, a battleship taking twenty-three minutes, though average times were betwen twelve and thirteen minutes. Both sides of the locks were used simultaneously and for passage in the same direction; thus each lock took seven torpedo boats or one battleship. The passage through the canal occupied times varying as follows: Torpedo boats, six and one-half hours; cruisers, seven hours; divisional torpedo boats, seven and one-half hours; battleships of the *Hazen* class, eight hours; the third division vessels, nine hours; the *König Wilhelm*, *Sachsen*, and *Wurtemberg*, twelve hours, and the four largest battleships, thirteen hours. For the larger vessels a delay of four hours took place while in the canal. This would reduce the actual time of passage to eight and nine hours, making the rate of speed a little less than 7 miles an hour or about 6 knots. In the latter part of 1895 the four battleships of the first division made the passage through the canal, about 1,000 yards apart, in about ten and one-half hours, at an average speed of 5 knots, or nearly 6 miles an hour. In all, thirty-six men-of-war passed through, comprising all the fleet except fifteen torpedo boats. Although slight interruptions were experienced, nevertheless merchant ships passed through the canal both ways while the fleet was in transit, and the average daily tonnage was but little affected.

It is manifest that the strategic importance of this canal to Germany is very great. The arrival of reenforcements at any point during war is often a matter of minutes, and the command of the sea can be determined as well by interior lines as can any operations on shore.

It remains to be determined, however, whether the western approaches are available at all times and under all conditions of wind and sea.

The draught of water given for the *König Wilhelm* is 8.10 meters (26.57 feet); that of the *Brandenburg* is 8 meters (26.24 feet); practically the same, though the mean draught of the former is given as 7.8 meters (25.6 feet) and of the latter as 7.44 meters (24.4 feet). Between Cuxhaven and Brunsbûttel, at the confluence of the Oste, the depth of the Elbe is given as from 7 to 7.5 meters (22.9 to 24.6 feet). With an easterly wind and extreme low water the larger battleships might be compelled to wait from three to four hours before entering the canal or leaving the Elbe—a time sufficient to neutralize the advantage gained while


SKAGER RAK.
KATTEGAT
DENMARK.
NORTH SEA.
SAMSÖ BELT
GREAT BELT
ZEALAND
COPENHAGEN
FUNEN
LITTLE BELT
LANGELAND BELT
LAALAND
STRALSUND
BALTIC SEA
DARSS POINT
KIEL BAY
BALTIC & NORTH SEA CANAL
KIEL
HELGOLAND.
ELBE RIVER
BRUNSBUTTEL
CUXHAVEN
HAMBURG
WILHELMSHAVEN
— GERMAN NAVAL —
MANŒUVRES
1896


ANAL.
KIEL

passing the canal. In the meantime, until the upper reaches of the Elbe are rectified in accordance with some definite scheme not yet formulated, the lower channel must remain as it is.

From Helgoland to the mouth of the canal at Holtenau the distance is 115 miles; to the embouchure of the Little Belt, 145 miles; to that of the Great Belt, 147 miles; to Grön Sound, 205 miles; to a point south of Copenhagen, off Skanor, 255 miles. Around Denmark the distances are, respectively, 520, 490, 480, 490, and 445 miles, representing savings of distance in favor of the canal of 405, 345, 332, 285, and 190 miles. Allowing an average speed of 14 knots for the sea routes (too high an estimate except for torpedo vessels) and 6 knots for 60 miles of the canal routes, with 14 knots for the rest of the distance, we arrive at the following times: Helgoland to Kiel, by sea 37 hours, by canal 14 hours; to Little Belt, by sea 35 hours, by canal 16 hours; to Great Belt, by sea 34.5 hours, by canal 16 hours; to Grön Sound, by sea 35 hours, by canal 20 hours; to Skanor, by sea 31.3 hours, by canal 24. From Wilhelmshaven to Helgoland is 45 miles, to Cuxhaven is 62 miles, and to the Elbe mouth of the canal 16 miles farther. The times given above, of course, are only approximate, but they serve to illustrate the great gain in time obtained by the canal. Bad weather and fogs have not been considered. There can, however, be no question of the strategic value of the canal to Germany. As long as Helgoland and Kiel are defended, so long may the canal be considered free from attack. The power to double the naval force operating either in the North Sea or in the Baltic practically doubles the power of the German navy.

THE ITALIAN MANŒUVRES.

The manœuvres were conducted under the supreme command of Admiral the Duke of Genoa, who hoisted his flag aboard the royal yacht *Savoia.*

The following theme was set: An enemy in superior force decides to risk a landing in order to destroy communications with the interior and to bombard coast towns. When hostilities are declared, however, his fleet is divided, and, although united, superior to the defense, separated, either part is inferior. Hence his first object is to effect junction and then to defeat the defense, so as to remain master afloat before landing. The object of the defense is to prevent the junction, to destroy the hostile divisions separately, and to defeat every effort to bombard or land.

The defense was intrusted to the *Active Fleet;* the attack to the EVOLUTIONARY FLEET, organized July 21.

The defense was called *green* and the attack YELLOW; following the usual custom of this office, the *green fleet* will be designated as *red* and the YELLOW FLEET, BLUE.

The following-named vessels took part in the manœuvres:

H. R. H. the Duke of Savoy, commander in chief, aboard *Savoia;* Vice-Admiral Carnevaro, commanding *Active Fleet,* aboard *Sicilia;* Rear-Admiral E. Gualterio, second in command, aboard *Francesco Morosini.*

Active Fleet.

Ship.	Class.	Date of completion.	Displacement.	Guns main battery.	Maximum speed.	Complement.
SPECIAL.			*Metric tons.*		*Knots.*	
Savoia (flag)	Royal yacht	1883	2,850	......	14.5	225
Elba (tender)	Protected cruiser, second-class	1892	2,732	10	17.9	257
First division (Maddalena).						
Sicilia (flag)	Battleship	1891	13,298	28	18.2	785
Sardegna	.....do	1890	13,860	28	20.2	785
Marco Polo	Protected cruiser, first-class	1892	4,583	16	19	315
Piemonte	Protected cruiser, second-class	1888	2,639	12	22.3	257
Partenope	Torpedo vessel	1889	834	1	19	111
Second division (Maddalena).						
Francesco Morosini (flag)	Battleship	1885	11,324	10	16.5	509
Andrea Doria	.....do	1885	11,204	10	16.5	509
Giovanni Bausan	Protected cruiser, second-class	1883	3,330	8	17.9	276
				Tubes.		
Tripoli	Torpedo vessel	1886	848	4	20	111
Trinacria	Torpedo school-ship—umpires	1884	9,207	......	18.5	259
Pagano	Cistern ship	1877	390	2	9	34
Citta di Milano	Transport	1886	2,123	2	9	......
TORPEDO BOAT FLOTILLA (Maddalena).						
First division.						
No. 102	Torpedo boat, first-class	1887 1888	79	3	22.5	17
No. 104	.....do	1887 1888	79	3	22.5	17
No. 110	.....do	1887 1888	79	2	22.5	17
No. 124	.....do	1889 1892	79	2	23	17
No. 149	.....do	1894 1895	79	2	22	17
No. 195 (?)	......	......	......	......	......	......
Second division.						
No. 117	Torpedo boat, first-class	1895	79	2	22	17
No 127	.....do	1889 1892	79	2	23	17
No. 141	.....do	1893 1894	79	2	22	17
No. 142	.....do	1893 1894	79	2	22	17
No. 148	.....do	1894 1895	79	2	22	17
No. 157 (?)	......	......	......	......	......	......

Active Fleet—Continued.

Ship.	Class.	Date of completion.	Displacement.	Guns main battery.	Maximum speed.	Complement.
Third division.			*Metric tons.*		*Knots.*	
No. 91	Torpedo boat, first-class	1887 1888	79	3	22.5	17
No. 99	do	1887 1888	79	3	22.5	17
No. 103	do	1887 1888	79	3	22.5	17
No. 134	do	1889 1892	79	2	23	17
No. 139	do	1893 1894	79	2	22	17
No. 146	do	1893 1894	79	2	22	17

Vice-Admiral Morin, commanding MANŒUVRE FLEET, aboard RE UMBERTO; Rear-Admiral Gonsalez, second in command, aboard ITALIA.

MANŒUVRE FLEET.

Ship.	Class.	Date of completion.	Displacement.	Guns, main battery.	Maximum speed.	Complement.
First division (Vado).			*Metric tons.*		*Knots.*	
RE UMBERTO (flag)	Battleship	1888	13,893	28	18.2	785
LEPANTO	do	1882	15,900	16	18.3	748
FIERAMOSCA	Protected cruiser, second class	1888	3,595	8	17.5	315
CALATAFIMI	Torpedo vessel	1892	846	1	20	111
Second division (Cagliari).						
ITALIA (flag)	Battleship	1880	15,654	16	18	748
RUGGERO DI LAURIA	do	1884	11,174	10	16.5	509
STROMBOLI	Protected cruiser, second class	1886	3,898	8	17.3	315
EURIDICE	Torpedo vessel	1891	919	1	19.8	111
TORPEDO BOAT FLOTILLA (Cagliari).						
First division.				*Tubes*		
NIBBIO	Torpedo boat, first-class	1888	139	3	26.6	24
AVVOLTOIO	do	1888	139	3	26.6	24
AQUILA	do	1888	139	3	26.6	24
FALCO	do	1888	139	3	26.6	24
SPARVIERO	do	1888	139	3	26.6	24
Second division.						
No. 64	Torpedo boat, first-class	1885 1887	79	3	22.5	17
No. 100	do	1887 1888	79	3	22.5	17
No. 101	do	1887 1888	79	3	22.5	17
No. 150	do	1894 1895	79	2	22	17
No. 153	do	1894 1895	79	2	22	17

MANŒUVRE FLEET—Continued.

Ship.	Class.	Date of completion.	Displacement.	Guns, main battery.	Maximum speed.	Complement.
			Metric tons.		*Knots.*	
Third division.						
No. 66	Torpedo boat, first-class	1885 1887	79	3	22.5	17
No. 83	....do	1888	79	3	21	17
No. 112	....do	1889 1892	79	2	23	17
No. 115	....do	1889 1892	79	2	23	17
No. 133	....do	1889 1892	79	2	23	17
No. 135	....do	1893 1894	79	2	23	17

Junction of BLUE SQUADRON and the routes allowed were comprised within a line from Cape Vado to its intersection with the meridian of Cape Spartivento.

In addition to information obtained by cruisers, semaphores and lookout stations previously established, and pigeons from Spezia, Maddalena, Rome, and Gaeta were allowed for *Red* and from Ozieri, for BLUE,

Whenever deemed necessary by the supreme authority an armistice will be granted to allow coaling at indicated ports. A second order will indicate the resumption of hostilities. Upon each flagship an officer of the general staff will be embarked as umpire.

Value of fleet fractions or detached vessels will be determined as follows: A first-class BLUE vessel will rate as one and one-half a *Red* vessel; the *Marco Polo* will rate one-half. A torpedo boat squadron to augment by one fourth the value of a battleship.

The four *Red* battleships and the *Marco Polo* to have a tactical value of four and one-half; the BLUE squadrons each to have a value of three and three-fourths, and, including torpedo boats, the Vado squadron four and one-fourth, the Cagliari squadron three and seven-eighths. A single torpedo boat to have no tactical value. After twenty-four hours torpedo boats to lose half their tactical value, and after seventy-two hours, all; but original value can be recovered by lying twenty-four hours in a friendly port. This would be a great disadvantage to BLUE, as boats were allowed to go only either to Savona or Cagliari.

Tactical contact to be determined by coming to 3,000 meters (3,281 yards) in the daytime and by visibility at night.

(1) The various forces to weigh together.

(2) Speed for *Red* battleships 10 knots; for BLUE, 8 knots. Other vessels of either force can steam 12 knots.

Junction to be effected either south or north of Elba by either the east or west channel in face of an adversary superior in speed. After junction speed conditions to be reversed.

The ships assembled in Spezia, the BLUE FLEET, under Vice-Admiral Morin, being the first to arrive. August 13 the *First division* of the *Red Fleet* arrived, followed August 15 by the *Second division.* Admiral the Duke of Genoa arrived August 19, and on the 21st hoisted his flag on the *Savoia.* August 22 the SECOND DIVISION of the BLUE FLEET weighed for Cagliari and the *Red Fleet* the next day for Maddalena, followed the same afternoon by the FIRST DIVISION of the BLUE FLEET for Vado.

In order not to circumscribe the BLUE FLEET too closely at the beginning of hostilities, the northern limit was changed to a line from Cape Mele to Cape Corso. August 24 the *Savoia* with the torpedo vessel *Elba* in company, left about 9 p. m. for San Stefano, the temporary base of observation selected by the commander in chief. August 26 it was ordered that hostilities would begin next day and all the squadrons were ordered under way at 4 p. m. August 27 the *Savoia* weighed and proceeded to the probable theater of operations.

August 26, 27, while patrolling the Piombino Channel, torpedo boats *Nos. 102* and *134* collided. The *Trinacria* and *Pagano* towed them to Port Longone, where the *Savoia* anchored to investigate the collision. The boats were not seriously damaged, and were repaired sufficiently by the *Trinacria* to be sent under convoy to Spezia. August 28 the *Savoia* weighed at 10 a. m., the *Elba* at 11, and searched in different directions for the hostile fleets. Passing to the eastward, the torpedo vessel *Elba* made out the *Sicilia*, *Sardegna*, *Marco-Polo*, *Francisco*, *Morosini*, *Andrea-Doria*, *Giovanni Bausan* in column, with the torpedo vessels *Partenope* and *Tripoli* to port, steaming near Capraira, and guarding the channels through which alone the enemy could effect junction. During the day a flight of pigeons was made, distant about 150 kilometers (93.2 miles) from Rome.

At 5 p. m. the *Savoia* anchored at Porto Ferraio, where four *Red torpedo boats* put in during the night for shelter. The *Trinacria*, with a detachment of torpedo boats, guarded the Piombino Channel. About sunset the San Benigno semaphore station reported the BLUE FIRST DIVISION about 30 miles southwest, heading southwest, and the Giglio semaphore station that the SECOND DIVISION was in sight to the southwest, distant 20 miles.

August 29 the *Elba* was sent to San Stefano, returning the same day. The *Trincria* was seen at anchor near Port Longone. In the meantime the *Savoia* weighed and cruised in the Piombino Channel, where the *Elba* rejoined her at 6.40 p. m.

Red Fleet.

August 26 weighed from Maddelena at 4 p. m. and stood for the Island of Capraria, where patrol duty was taken up guarding the Piombino Channel and the western passes about Elba. Nothing of any moment occurred, nor were the enemy's vessels seen. No news was obtained of the movements of the southern force, and as approaches from that direction had been thoroughly reconnoitered and the semaphore stations were vigilant, it was deemed impossible for that force to break through as long as the weather kept clear. August 29, however, conditions became unfavorable for the defense, the weather became unsettled, there was no moon, and it was feared the SOUTHERN DIVISION would slip through undiscovered. Under these circumstances, Vice-Admiral Canevaro determined to abandon the channel defense and to attack the NORTHERN DIVISION with his whole force to surprise it and put it out of action by tactical contact under the rules. The *Actire Fleet* steered north, with cloudy weather and a northwest wind and sea. At 7.15 p. m. tactical contact was made with the FIRST DIVISION, consisting of the RE UMBERTO, LEPANTO, FIERAMOSCA, CALATAFINIA, and the torpedo boats of the FIRST DIVISION. It had been the intention of Vice-Admiral Canevero to turn south when he had destroyed the FIRST DIVISION and attack the SECOND DIVISION of the BLUE FLEET, but the commander in chief, upon receiving information of what had taken place, ordered an armistice from San Stefano, with instructions by telegraph for the *Red Fleet* to rendezvous at San Stefano and the BLUE FLEET at Gaeta.

BLUE FLEET.

Under the rules the FIRST DIVISION of the BLUE FLEET had been compelled to return to Vado, from which port Vice-Admiral Morin telegraphed the result to the commander in chief August 30.

The SECOND DIVISION kept out of range of the semaphore district allotted the enemy, appearing in sight at long range occasionally, but failed to make an effort to break through, in spite of the darkness toward the latter part of the period. The first phase terminated when the armistice was ordered.

August 31 the *Savoia* left San Stefano and arrived at Leghorn September 1. The *Marco Polo* and *Elba* were detached by orders from Rome. September 3 telegraphic orders were issued to both fleets that hostilities would begin at midnight.

The southern limit of the theater of war was fixed by the line between Capes Figari and Circeo.

The objects set the BLUE FLEET were: First, to sever lines of communications ashore, thus to prevent junction and cooperation by the land forces; secondly, to find the defending (Red) force and with a superior force to bring it to action, also to bombard maritime towns.

The *Red Fleet* was first to guard the railway communications; secondly, to surprise the enemy under conditions that would deprive him of the tactical advantage due to numerical superiority.

September 4 both fleets went to sea shortly after midnight. The *Red* cruisers were sent to the north of Elba to scout; the *Pina* laid a line of torpedoes (submarine mines) before Civita Vecchia to prevent bombardment, and the rest of the fleet concentrated at Porto-Ferraio. The BLUE FLEET sent a torpedo boat flotilla to destroy the cable communications between the Tuscan Islands and Piombino, at the same time two other torpedo boats were detailed to operate between Monte Argentario and Monte Circeo while the main force concentrated its efforts to cut the San Remo-Spezia Railway line in the Gulf of Genoa. In the evening the *Red Fleet* put to sea and joined the cruisers north of Elba. The semaphore station of Monte Grosso controls an extensive view of about 30 miles, and it was hoped by its aid to watch the movements of the BLUE FLEET. September 5 the FIERAMOSCA, EURIDICE, CALATAFIMI, and two divisions of torpedo boats attacked the railway communications on the Genoa-Spezia line, the cable at Piombino, and destroyed the semaphore stations of Pianosa, Giglio, and Gorgona. The main force attacked the southeast coast and bombarded Civita Vecchia. Informed that the enemy had appeared in the Gulf of Genoa, the *Red Fleet* started at once in pursuit, but failed to come in contact with the enemy's main force. It is well to note the exploits of the FIERAMOSCA. She cut the cable at the Island of Gorgona and destroyed the semaphore station there, an advanced post and a most important strategic position. She took part in cutting railway communications, bombarding Levanto, near Spezia where the railway works were destroyed. Next she blew up the viaduct of Recco, situated about 14 kilometers (8.7 miles) south of Genoa, and finally successively bombarded Varazze and Savona and blew up the railway about Albissola. During thirty-six hours she eluded the whole *Red force.*

September 6 the *Giovanni Bausan* cruiser, aided by four torpedo boats, however, succeeded about 10 a. m. in putting the cruiser FIERAMOSCA out of action. About noon the *Sicilia*, *Sardezna*, *Francesco Morasini*, *Andrea Dovia*, and *Partenope* were off Spezia steering south. At 3 p. m. the *Partenope* was sent to communicate with the signal station at Palmaria. She returned with the signal flying, "You are nearing the enemy." At this time the vessels were steering toward Elba, and the BLUE FLEET was bombarding Porto Ferraia. Course was changed at once, as by the rules governing the second phase the *Red* vessels were inferior by day to the BLUE vessels and were unable to assist in the defense of their base.

September 7 another effort was made to bring on a general action, but the BLUE FLEET evaded the attempt. During the night, however, an engagement took place between the torpedo vessel *Tripoli* and the *Trinacria* and the cruiser STROMBOLI. A pigeon was sent from the *Sicilia* to Spezia, 60 kilometers (37.9 miles) distant, informing the commander in chief of the effort to bring on a general engagement. During the day the *Red Fleet* covered Genoa, while the BLUE FLEET sought to destroy communications, cable connections, and signal stations, among others destroying that at Capraria. During the night No. 133 was put out of action. September 8 hostilities ceased. The *Red Fleet* was ordered to rendezvous at Genoa and the BLUE FLEET at Spezia. This ended the manœuvres proper, but a third part took place which deserves notice. The exercises consisted of (1) an attack on the fortified port of Spezia; (2) a review by the King, who hoisted the royal standard aboard the *Savoia*, followed by tactical evolutions and target practice at moving targets.

September 23 the two fleets united in the Gulf of Rapallo and remained at anchor during the night.

September 24, at 6 a. m., the ships were off Spezia, about 5 kilometers (3.1 miles) from Tino Island. The torpedo-boat flotilla of the defending force in two squadrons, each of three divisions, was posted well screened in Venere and Serici bays. The signal for the attack was given by hauling down a flag hoisted at the Palmaria semaphore station, following the motions of the *Savoia*. The forts and ships exchanged fire with blank cartridge. After the signal to cease firing, made from the *Savoia*, the vessels moored in the bay.

September 25 the royal review took place, followed by target practice. The fleet formed double column, each ship towing a target. Returning to the anchorage, the vessels passed astern of the *Savoia* with engines stopped. Details concerning these exercises are wanting.

September 26 the Duke of Genoa relinquished his position of commander in chief and hauled down his flag.

CASUALTIES.

A man fell overboard from one of the vessels of the SECOND DIVISION the night of August 27, 28. The vessels were in squadron, cruising under obscured moonlight and exercising every precaution to avoid being seen from the Canevaro semaphore station. The signal "man overboard" was made, the vessels stopped, lowered lifeboats, picked up the man, and retained formation throughout.

AQUILA, torpedo boat, thrown against the REIGGIERO DI LAURIA by a heavy sea August 27. The after part of the deck was injured by an anchor driving into it when the vessels came together. The AQUILA was escorted to Maddalena for repairs, and left in two days to rejoin the FIRST DIVISION.

Nos. 103 and *134,* August 27, came into collision while cruising in the Piombino Channel. Neither boat was seriously damaged. *Nos. 91* and *99* and the *Trinacria* and *Pazano* went to their assistance. Temporary repairs were made at Port Longone and the boats were sent to Spezia. Lieutenants Millo and Rouca, commanding *Nos. 91* and *99* were especially commended in general orders for intelligent and efficient help rendered on the occasion of the collision. There was no panic aboard the colliding boats. All the above incidents indicate a high state of discipline.

PIGEONS.

As noticed in the theme, a regular homing-pigeon service was organized, using the military cotes of Spezia, Maddalena, Rome, and Gaeta for the *Red Fleet*, and that of Ozieri for the BLUE FLEET. The principal centers were established aboard the *Sicilia*, under the direction of a lieutenant of infantry, the RE UMBERTO, under the direction of an officer especially detailed by the war office, and aboard the *Savoia* by an officer similarly detailed. Petty officers assisted. Four flights were made, one from the *Sicilia* at Maddalena, fifteen hours to Rome; another from the same ship between Capraia and Vado, and two from the *Savoia* between Elba and Monte Argentario. The pigeons are kept in appropriate cages, well aired. Female birds seem better for short flights. Male and female birds are kept separate. Each flight comprised about five birds fed about two hours before starting. Speed was about 77 kilometres (47.8 miles) an hour.

The messages are inclosed in a goose quill sealed at each end and secured under one of the center tail feathers. The messages are written on thin vellum, rolled, and so placed that the address can be read through the quill. A journal is kept of each bird, showing date of hatching, name, number, the number of the cote it belongs to, the flights made and their character, whether good, passable, or mediocre. The bird's number is stamped indellibly in various places under the wings and the number of the cote under the tail.

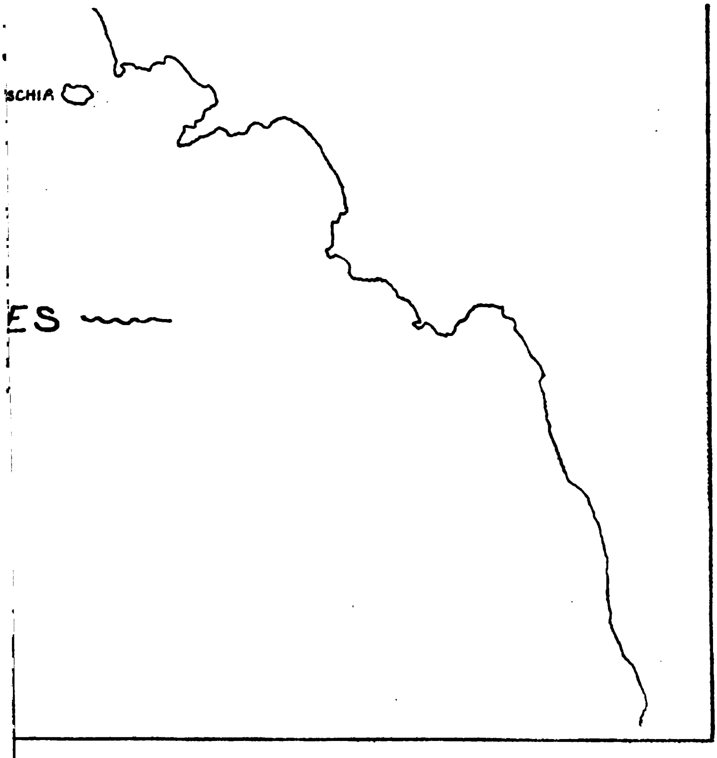
August 27, from the *Savoia*, seven birds were released, and all arrived at Rome the following day, though the last bird lost its message. August 30 a flight of three birds from the same ship arrived successfully. September 2 a bird arrived in Rome that had returned to the *Sicilia*, having been released August 31.

Many results have been kept secret, but the general result is regarded as eminently satisfactory.

COMMENTS.

The first phase is interesting chiefly from the action of Vice-Admiral Carnevaro in seeking the FIRST DIVISION of the BLUE FLEET with his whole force and destroying it. It is to be regretted the dispositions taken to find the enemy are not fully given, nor is the information of the movements of the BLUE full enough to warrant a decided opinion as to whether the search for the FIRST DIVISION was preferable to that for the SECOND DIVISION. From Maddalena to Ranosa is 88 miles, to Giglio 96 miles, and to Capraia 110 miles; from Vado to Capraia 95 miles, and from Cagliari to Capraia 285 miles. At 8 knots, either BLUE DIVISION using the Piombino Channel would be in sight about twelve hours from semaphore signal stations during the day, and possibly about ten hours during ordinary nights. These considerations rendered it nearly impossible for BLUE to attempt the Piombino Channel, making it highly probable any effort to pass would be toward the Corsican Coast. The northern, or FIRST DIVISION, was signaled a long distance away and found by the *Red* force. It is not known whether any plan previously arranged was to bring the BLUE DIVISIONS simultaneously upon the field of operations. Speaking generally, the task set BLUE was hopeless, for *Red* coming into tactical contact at either extremity of the semaphore field of observation with a BLUE DIVISION would have a marked superiority of force and speed for about six hours. As far as can be determined from the information at hand, the solution of the problem by Vice-Admiral Carnevaro was based on sound military principles.

The result of the raiding operations during the second phase is remarkable chiefly for the impunity enjoyed during about thirty-six hours by the cruiser FIERAMOSCA and the effect to be produced upon the mobolization and concentration of the land forces by such raids. The Italian authorities consider that this raid has demonstrated the vulnerability of the coast. As a practical effect, an addition of 10,000,000 lire ($1,930,000) has been asked for in the naval estimates. The only adequate protection against the raids of fast cruisers is to meet them with similar vessels stationed along the coast.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VII.

THE LOGICAL CONSTITUTION OF THE FRENCH FLEET.

Translated from le Revue des Deux Mondes, March 1, 1897, by Lieut. Commander E. B. Barry.

Having reached one of those periods when a nation asks if it is not time to change the point of application of her exterior efforts; uncertain of the exact political shifting, of which she no longer is absolute mistress to direct as she desires; doubtful if the next war will be continental or maritime, France sees she has neglected her navy. Not that she has not docily furnished the annual sums asked to maintain the naval establishment; not that she has not sought in many ways to control the employment of these sums, nor that she has not seen serious defects in maritime development. What has been wanting has been in the method of distribution of financial expenditure, and tenacity in the repression of abuses, the gravest of which, in the working of dockyards for instance, owed their origin to our social condition and their development to parliamentary rule. What, above all, has been wanting is a clear, comprehensive view, of what this naval establishment should be; of what, in the first place, ought to be the armed force acting on the sea and by means of the sea, the military fleet—the sole reason for existence and supreme expression of the naval establishment. In the following study, after having recalled the general principles of the constitution of fighting fleets and the conditions essential to their existence, to their prosperity, and to their success, we shall apply these principles to the diverse elements of the French fleet and try to find how it can satisfy these conditions.

I.

The determination of the characteristics of a fighting fleet depends—

(1) Upon the geographical situation of the country under consideration.

(2) Upon the hydrographic conditions of the littoral and of the seas washing the coast.

(3) Upon its exterior and interior political situation.

(4) Upon its resources.

(5) Upon the faculties and special tendencies of the race inhabiting it.

Of these, some factors have a permanent, almost immutable, character; others, a relatively accidental and variable one. This distinction must be remembered.

Let us examine the geographical situation of France. Few lands are more favorably situated for the development of maritime power, or that better justify the existence of a fighting fleet. Better situated than even England, France is placed upon the three principal seas of Europe, of which she commands, or can command, the embouchures either by the channel ports and the channel itself, or by those of Oran; for Algeria can be considered now as the African extension of France. Upon the European continent, in any case, we occupy what in strategy is called the central position. Unfortunately we do not gather all the benefits shown in 1814. We are in need of an interior line of communication; in need of a maritime canal to permit sure and rapid concentration in either sea of the two main divisions of our naval forces now separated by the Iberian Peninsula. Everyone knows what opposition during the past twenty years has been encountered by the proposition to pierce the Pyrenean Isthmus. What is less known, however, is that at this present moment Great Britain is executing important works at Gibraltar. The day will come when our eyes will be opened to this danger, and from this moment we should determine the draught of our battleships in view of the eventual utilization of an interior maritime waterway. We know already how to do it. A few years after the war of 1870 an expert constructor designed and built an armored vessel more capable of operating upon the shoal coasts of the North Sea than were any of her predecessors; the *Redoutable*, still one of the best units in our active fleet, easily can traverse the proposed canal. Here is an interesting indication, which later we shall see confirmed.

If the deep waters of the Mediterranean, as well as those on the coast of Brittany, easily admit all draughts, the weighty battleships, immersed by their armor to a depth of over 8 meters, will not be well off upon the channel coast to the eastward of Cotentin, and particularly beyond Cape Griz Nez, where the North Sea sand banks begin. The interest we take in trying to diminish the difficulties of free movement for large vessels in Calais and Dunkirk roads is before the eyes of all prudent sailors. Dunkirk is, by the force of circumstances, a more important base than Cherbourg. Let us lay down the rule that our best ships shall not draw more than 8 meters from the channel to the end of the Baltic. In northern navies this is an admitted rule. But why impose this limit since it concerns vessels called frequently, almost exclusively, to the Mediterranean? The five armored cruisers of the *Italia* and *Re Umberto* types, these giants of 14,000 to 15,000 tons, succeed very well with draughts approaching 10 meters, perhaps, but cases can occur where an expert adversary can reap advantages from the caution that must hamper their manœuvres near land.

Difference of condition between the Atlantic and the Mediterranean should be more potent to determine unit types than should hydrographic characteristics. This difference of condition seems very visible without the necessity of referring to the phenomenon of tides. On one side, a obscured sky, fogs, poor light; on the other, brilliant daylight, clear horizon, where everything can be seen; here, the long waves of the Atlantic, powerful undulations, that lift the heaviest vessels like straws and then drop them into the masses of spray; there, waves, violent and raging, but short, that hurl upon the armored vessel "parcels of water;" attacks more troublesome than dangerous. Besides, to the anger of the big blue lake, quickly appeased, chains of big islands oppose barriers behind which shelter quickly can be found.

All this justified our forefathers, people of sense and judgment, in having two distinct navies; the navy of Ponant with its high freeboard ships, strong sided and heavily sparred; and the navy of the Levant with its fine galleys, agile and low, whose tactics, profiting by a motive power independent of the caprice of the wind, resembled very much those of modern fleets. Must we make use of this example and admit two distinct types of fighting ships; one with high sides (at least forward), the other with a low platform; one covered with vast superstructures which offer easy targets to the oft-repeated blows of rapid-fire artillery, the other presenting to the adversary only a reduced target and moving surface? Without hesitation this must be done.

It is not enough to search for the type of a seagoing monitor for the Mediterranean; this is easy. Intensity of fire will be so great in the battles of the future, and the destruction will be so complete by high-explosive shell of everything above the armored belt, that it would be well in the present time to direct the attention of constructors to the general problem of the lowering of the target and the suppression of this vertical wall. Willingly or not, the ship of the line must become like a fortress; since to desire to cover everything with armor is ruinous folly, and to pretend that one can sacrifice the upper works, where above all are installed essentials, where the crew lives, is to get a very strange idea of the practical conditions of war, to forget that one fights far from his base, and that to regain it one must take account of the sea and bad weather. Here, then, is what imposes upon us the study of two fixed elements to determine the types of a fighting fleet: The geographical position, with the special characteristics of the seas that wash the littoral and the hydrographic conditions; draught not greater than 8 meters (26.24 feet); distinct types of the larger units of combat for the ocean and for the Mediterranean; low free board in the latter, awaiting the solution referred to above.

II.

Let us examine the variable factors and then the political situation both interior and exterior. It is unnecessary to demonstrate that interior politics can exert an influence upon the existence of a big navy, as the actual facts within the past ten years conclusively show.

When the war of parties results in changing every six months the direction given to naval construction, almost complete paralysis attacks the service that has for its object the maintenance of the naval establishment on an efficient basis. It has often been said that none of the great national organisms require as much as does the navy—stability, sequence of ideas, perseverance, and development. History proves it. Our fleets were victorious, or strong enough to intimidate the eternal adversary under solidly established powers; they were vanquished under feeble or unstable governments. Nor is this all. Wedded to peace, modern democracies, when they think of war, allow only the defensive role; and it is with a sincere but dangerous conviction that they think to assure the integrity of their frontiers in constituting military organisms which respond exclusively to this. Besides, still more powerful is this instinct when it is combined with recollections of events as terrible as those of 1870; recollections which suffice to drive away all idea of aggressive politics. Unhappily it is necessary to distinguish between politics followed and the method of war which will be adopted. Let us be careful to avoid thinking that the passive condition of one will be the obligatory consequence of the reserve of the other. Whoever confines himself to defense alone courts risks without making his adversary run any, and it is right to say in modifying a celebrated statement of De Maistre: "Let us preach the defensive to diplomats and the offensive to military men." One can not prevent one's self from thinking of this after reviewing the defensive character which for twenty years has been assumed by our navy, the general composition of the fleet where coast-defense vessels dominate; that is to say units of combat kept in territorial waters by a small coal supply; and that it concerns each unit considered alone where defensive weapons lead to offensive ones. Finally that it concerns those war ports in front of which are accumulated powerless walls and innumerable batteries. Should we search where to place the responsibility for a state of things which without doubt reduces the strategic value of a military organization otherwise so well equipped with personnel, we will be led too far. Not long ago it was stated that we only had the fleet representing our politics and that the long incertitude of one explained the want of cohesion of the other. The excuse is insufficient, as we shall see, and it is inexact to state that the French fleet wants cohesion; on the contrary, taken altogether with this defensive character, it is homogeneous and besides it possesses remarkable tactical qualities.

The misfortune is that an offensive character and strategic qualities would be worth much more to it. Perhaps it would be more exact to say that for too long and too often our diplomatic timidity has been shown, producing in the highest military circles a sort of discouragement, depression, unconscious abandonment of essential principles in the art of war; and that these valued chiefs who thought to apply specious theories to the equilibrium of armament and protection did nothing in reality but submit to the depressing influence of their official condition. And it is thus through the want of firmness in daily acts more than by the want of precise system in general views that exterior French politics exerted the worst influence upon the constitution of our naval force. But uncertainty or timidity gives no sufficient excuse. It is not sufficient, because all the same those who direct the navy must admit the hypothesis of a war against the Tripple Alliance and firmly maintain their ground, as does the majority of the nation in its honest and artless conception of the highest if not the most tangible interests of our country. It has been necessary to acknowledge recently that a vigorous effort is required if we expect to contend with advantage against the united squadrons of Germany, Italy, and Austria. And how will it be later, as since 1890 these three powers have put into service 47 vessels, displacing 160,000 tons, while our fleet has been augmented only by 22 vessels, displacing 144,000 tons? Upon the hypothesis of a war against England, and above all in regard to what should have been done during the past ten years to guard against this great evil, I dare not even speak; for to struggle without too many unfavorable chances against such an adversary requires not only the construction of many vessels (England can construct twice as many and much faster) to perfect to the highest point types already known (what difference does a slight individual inferiority amount to in battle units if they have a crushing numerical superiority?), but also the fostering and use of all the resources of inventive genius, of a bold spirit of initiation, fertile in unexpected resources, detached from slow routines and vain formulæ. It requires the adoption of new methods of warfare, and to make use of these methods so as rapidly to create appropriate engines to be always in advance of a type as we were thirty or forty years ago—in a word, to do better and differently from England. Is this possible, and has it been tried? What has become of this inventive genius, formerly so brilliant and envied abroad? Has it been encouraged? Who dares to say so when one can see—one example among many—an invention like that of submarine boats, so dreaded by the English, checked in its natural development by the disdain of some and the jealousies of others? What has become of the initiative and reform spirit in all the branches of a service which showed such men as the Choiseuls, Suffrens, Granchins, Portals, d'Haussez, Trottes, de la Roche, Labrousses, and Gueydons, at a time like the present, when the worst reproach that can be made against a man is to find himself shut up in the rigid mold that all routine bodies impose upon intellect and where a squadron commander is suspected who, in order better to prepare his command for war, tries to escape from the common routine? Have war methods been changed or at least renewed and rejuvenated? One invents little in this line. Has anybody made an effort to find out in what way cruiser war against commerce will be as much justified to-day as it was little justified eighty-four years ago, after we already had lost exterior bases, fleets, and men, while at the same time England produced on her own soil enough to insure her subsistence, and France had something to lose in losing her merchant marine. Let us see if perhaps the actual conditions of naval war will not be more favorable to an armed descent than were those of 1692, 1799, and 1805; a question which the German naval officers have asked themselves for a long time, and which one of them lately answered in the affirmative. If people are wedded to fleet war, to the grand classical battle, let them recollect that we can not, inferior in number as we are, balance the power of our adversaries except by successive and rapid concentrations of our forces, either to the north or to the south. How can this be done without a maritime canal?

III.

Truly everything changes now, and this war will not seem so impious. Some, however, will find the change a little quick in this surprising about face, and they think to see the effect of a pressure in favor of an alliance—let us say an understanding—which not long ago stirred up the nation's anger. How act then to establish our calculations upon a solid basis? Well, since there is only a small number of Frenchmen who know, under a government of opinion and liberal discussion, upon which side France will be, let us admit in principle that our principal effort concerns the Triple Alliance. Later we shall determine what modifications it will be necessary to make to the elements thus determined, to adapt them to the exigencies of a struggle against England. It will not do when one wishes to determine the nature and value of his means of action, to take for point of departure the operations which he hopes to perform. In war there are at least two, and it is indispensable to preoccupy one's self with what the adversary may do; to discover what are, with his tendencies, his views, his special temperament, his proper means of action for defense and attack.

Germany—let us commence with her—had, until the reign of William II, a naval organization exclusively defensive, of which nothing was demanded but to enlarge a blockader's radius off the estuaries of the North Sea; to dispute as long as possible the Danish Straits; to worry the French fleet and to surprise its convoy either by an attack in flank beyond the Straits of Dover at the Skager Rack or at its debouché in the Baltic, should that fleet penetrate there to attempt a landing; finally, firmly to hold, before the Jade and Kiel, two favorable positions which the enemy would be obliged to mask by an important force before going north and later east. To this system, which combined judiciously defensive strategy with offensive tactics, aggressive under favorable circumstances, corresponded properly chosen engines: Four or five armored vessels of medium tonnage in the Jade, and with them some fairly rapid scouts; four others in the Baltic at Kiel; four armored vessels exactly alike, with low freeboard, to which was given the significant name of sortie vessels; thirteen armored gunboats and old-fashioned vessels for the local defense of ports, anchorages, and estuaries; finally, a superb fleet of large and good torpedo boats subdivided into divisions from the beginning of peace, objects of attentive care, thoroughly well disciplined. There is no need of speaking of several ordinary corvettes intended to show the imperial flag in distant seas. Since the Russian friendship seems to have cooled, they have not ceased to preoccupy themselves with the means to augment the usefulness of this naval force, and the best means, certainly, was to give it the line of interior communication across Holstein. Work on the maritime canal from the embouchure of the Elbe to the Bay of Kiel was begun in June, 1887. In the meantime, always looking ahead, always exact to do what was necessary at the right time, the German admiralty laid down three armored coast-defense vessels, relatively speedy—in any case well armed—in spite of their small displacement and light draught (4,000 tons and 5.50 m.—18.04 feet, *Siegfried* type).

At this time William II came to the throne. He was known to be very fond of the sea and possessed of knowledge of naval matters. His grandfather, said he, had organized the glorious German army. He would undertake to organize the Imperial fleet and to make of it a perfect military instrument—that is to say, an offensive one; for, to make war is to attack. Immediately things changed; a vigorous impulse was given to the work on the maritime canal; Helgoland, acquired from the English, became the advanced post, the grand guard of this strategic debouché; extraordinary credits were asked from the Reichstag to double the naval force, to give it powerful battle units (four of the *Worth* type, two of the *Kaiser Friedrich III* type); swift protected cruisers—armored cruisers, in fact (five of the *Kaiserin Augusta* and *Gefion* types)—like the new *Leipzig*, a superb vessel of 10,000 tons, equal to the best battleship. The old units were remade, modernized, and the *Konig Wilhelm*, for example, the first German vessel, came out capable of fighting in line with the most recent types. The small armored coast defense vessels of the *Siegfried* type (five others were laid down), found to be good seagoing vessels, were given economical boilers and a supplemental supply of petroleum, so that their radius of action would permit them to participate in offensive operations. It is well to note that the offensive is, in fact, the character of this new fleet; and the democratic party of the Reichstag did not deceive itself when it eloquently denounced in 1889, and every year when the budget is discussed it in vain denounces, the ambitious views of the young sovereign, the inflamed speeches wherein are exalted the aggressive spirit of German sailors; the conferences at the Kiel Academy to proclaim the necessity of number, rapidity, movement, and the preeminence of attack over defense; and the enormous growth of maritime expenses which do not produce—far from it—any reduction of military charges, and the menacing projects which they indicate and the more and more marked hostility of England.

But we Frenchmen, what can we think of all this? Are we to believe that a fine fleet of 10 armored vessels of different kinds as well as large cruisers or scouts; of 20 to 25 seagoing torpedo boats, all ready, permanently manned or mobilized in forty-eight hours, all new vessels besides, and capable of 15 knots at the least—are we to believe the guarding of the North Sea as the only object of this? No, certainly not. People have taken care to let us know it is the Channel which the German fleet expects to make the theater of its operations and its offensive forward movement with that of the 150,000 men who ought to throw themselves upon the Meurthe and the Meuse, preceding by three or four days the enormous mass of fifteen army corps. And what are we to hope? Bar the Channel with our inferior forces? But if one can bar a defile of a few hundred meters with a small body of men, who in the end are always beaten, one can not thus bar a strait of 21 nautical miles with 6 battleships against 10, with 18 ships against 40. And again what? Carry on a red-tape war, worry the adversary, impede all his operations? But we have neither Big Belt nor Little Belt, nor the superiority of speed, unhappily not possessing six *Dupuy de Lômes*. Are we to retire into the Bay of the Seine, equally dangerous to friend or enemy; or into the untenable Cherbourg; or into Rance and Trieux; finally to Brest? What use is it to discuss all these hypotheses, each worse than the others, and a defensive system which can not even present solid points of support on the most menaced littoral? More than ever before—alas for him that does not see it—the defensive will be disastrous in the Channel and the offensive is imposed upon us as much by evident political interests as by the well-understood military interest and the character of the nation. What forces are required for this offensive? Before the piercing of the Cimbric Isthmus little more than half the number of German seagoing vessels would suffice. To-day, in spite of the Russian cooperation, it is necessary to take note of interior communications which permit the new maritime route, and the number will not be less than two-thirds of the active naval force of the Empire—that is to say, 14 battleships or armored cruisers, 12 scouts, and at least 4 squadrons, each of 6 or 8 seagoing torpedo boats, with a destroyer for chief of group. To the 50 naval fighting ships which thus will form the squadron of operations will be joined 5 or 6 auxiliaries; squadron colliers and transports to replenish the light squadron with special coal, fresh water, torpedoes, relief crews—torpedo-boat crews exhaust so quickly—hospital ships, colliers, etc. This gives the number. What will be the characteristics of the different types? In a general manner predominance of offensive and strategic qualities; reduction of draught to the lowest possible limit. Let us particularize for the battleships and armored cruisers. These two types, which tend to merge into each other and to which can be applied with equal justice the name of unities of combat, will be represented by vessels of 10,000 tons for the one[1] and of about 7,000 for the other; maximum speed to be 20 knots; their fuel capacity, of which the hydrocarbons will take a large part, will not be inferior to 1,000 tons; the battery will not exceed for the one a caliber of 24 centimeters (9 45 inches), for the other 19 centimeters (7.48 inches), the perforation of heavy armored belts by means of huge cannon having become to-day, more than ever, a ruinous Utopia. On the other hand, this artillery, although of modest appearance, will be not less efficacious, comprising a great number of 16 or 14 centimeter (6.3 inches or 5.5 inches) rapid-fire guns with several short and light cannon of large caliber destined either to give curved fire or to discharge during battle projectiles of great size—shell torpedoes; while as to torpedoes, properly so called, our vessels should have about thirty, divided among seven tubes. The system of protection will see the proportion of its weight in the total displacement diminished in a sensible manner; a well-devised subdivision of the hull, 10 to 20 centimeters (3.94 to 7.87 inches) of hardened steel for the belt and principal battery, cofferdams in the compartments where cellulose is introduced. Finally, an armored deck and splinter guard will be all that is necessary, as on board the new vessels which to-day are put into service in England, Germany, and Italy. Draught will be 8 meters (26.24 feet) for the 10,000-ton ships and 7 meters (22.96 feet) for the 7,000-ton vessels.

Next, the scouts. To these vessels, of a mean displacement of 3,000 tons, it is necessary to give a speed of 22 knots, obtained without too much strain on the boilers, without too great coal consumption, and whose coal capacity must furnish a steaming radius 50 per cent superior to that of a battleship. Such results will not be purchased too dearly by a reduction of from 60 to 40 millimeters (2.36 to 1.57 inches) in the thickness of the armored deck, on condition that the cellular cofferdam is placed judiciously. Two guns of 16 centimeters and six of 14 or 10 centimeters (10 centimeters=3.94 inches) will suffice for the offensive armament with the ordinary proportion of light guns and four or five

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[1] The division of weights for these vessels will be nearly as follows:

	Per cent.	Total displacement.
		Tons.
Hull	35	3,500
Engine and auxiliaries	20	2,000
Combustible material	10	1,000
Protection	20	2,000
Battery	8	800
Crew, water, etc	6	600
Available	1	100
Total	100	10,000

torpedo tubes. It is essential that the draught shall not exceed 6 meters (19.68 feet), easily obtained with 3,000 tons, as it will be necessary always to be able to navigate the Sound without fear and in almost any weather.

Let us examine now the torpedo boats. A fleet which takes the offensive in restricted waters perfectly known to the enemy must have in advance a flotilla capable of clearing its route by rapidly beating up the torpedo boats ambuscaded in favorable recesses. It is necessary, then, to raise the displacement of our actual type of vedette from 150 to 200 tons, to give it a decided advantage over the *Schichau* model; an advantage which will be indicated above all by the employment of a 65-millimeter (2.56 inches) cannon. It will be necessary also to have the chiefs of groups clearly superior to the German divisional torpedo vessels of 400 tons. If the displacement of our high-speed avisos, like the *Cassini*, 900 tons, seems too great, can not it be taken about 600 tons, so as to have even then with an equal speed (26 knots) a more powerful artillery and a greater endurance? This seems to be, in view of the actual political situation, the logical constitution of a fleet for operation and destined to take an offensive rôle in the north of Europe.

IV.

Let us now pass to the Mediterranean, where the exact evaluation of the forces of our adversaries will not permit delicacy, as it depends upon the opinion formed of the cooperation of the two navies of Austria and Italy. If a great conflict breaks out we know well that the recollections of Lissa quickly will be effaced. But there is another thing. The violent shock which will put into opposition the five great European continental powers will have an immediate reecho in the Balkan Peninsula, so divided, so agitated, so well divided between the two parties. The Slav population of Bosnia and Herzegovina, impatient under the Austrian yoke, will not allow this unique occasion to obtain their freedom to escape them. Certainly it will not require great temerity to admit that the bellicose Montenegrins, friends of Russia, will descend from Tserna-Gora to aid their brothers. It is said that they are well organized, well equipped, and ready for any great work. The theater of operations marked for the Austrian navy is behind the curtain of the long Dalmatian Islands; this indented and tempest tossed littoral, where the mountains are promontories and the valleys gulfs, where fiords rapidly can conduct to the foot of Cettinje an army corps embarked at Pola and permit it to take in reverse the invaders of the Bosnian plain. Will Dulcigno and Cattaro be equipped with fixed and movable maritime defenses? It is too much to expect. In any case there may perhaps be enough left there for a navy to do, of which the modest resources of the Austro-Hungarian Empire, the embarrassment of dualism, and also its direct dependence upon the rival organization, the army, check its normal development. But in despite of prognostics which seem justified, it is prudent to suppose that after having reserved their second-rate vessels for operations upon the coast of Montenegro, the Austrians will construct for concerted action with the Italians a a strong division of 3 battleships (2 new, 1 remodeled—the *Tegethof*), 3 armored or protected cruisers, 3 high-speed scouts, and 12 seagoing torpedo boats with divisional destroyers, as in Germany. Let us not deceive ourselves; the balance of this very mobile naval force, well armed, manned by sailors and directed by officers of whom we know the worth, will augment very much the power of the fleet that will be opposed to us in the western basin of the Mediterranean. Added to others, this is a serious reason for us to take the offensive and to reach the Ionian Sea as rapidly as possible to prevent the junction of the allies. In truth, the adoption of this theater of operations, though slightly eccentric, supposes the previous construction, either at Tunis or at Bizerta, of a base solidly defended and well provided with coal, munitions, torpedoes, and the most essential duplicate articles.

Let us leave this a moment to examine closely the Italian forces. A most interesting fleet, it has exactly what ours needs—absolutely wanting, stated better, in noting certain recent progress—and truly the Germans and the English have been very able thus to oppose to each other two navies which complete each other so well; for the day that our southeastern neighbors perceive that they are playing without any great profit the game of these able politicians—the day, in fact, when will be born between the Latin peoples an understanding founded upon reciprocal respect for their aspirations—that day the northern races will cease to dominate the Mediterranean. The great interest of this fleet, to return to the present and to reenter reality, is that it is offensive; that it is so resolutely, of deliberate purpose; that for a long time, for twenty years in fact, in spite of some inevitable fluctuations, it has been so longer than the German fleet. Here is a well-marked confirmation of what we maintained above, the influence of exterior politics, and, above all, the diplomatic attitude upon the constitution of a country's naval force. But, above all, it was necessary that this country, eventually to sustain an attitude which must, from many views, provoke catastrophe, should have found men as remarkable as naval men and administrators as the Brins, the St. Bons, the Morins. The active forces destined by the Italian Admiralty to operate at sea comprise 12 battleships (2 building, 1 repairing) and 3 armored cruisers (including the *Marco Polo*), making 15 units; 15 protected cruisers or scouts, but powerfully armed, upon which they rely to increase the line of battle; 13 smaller scouts, and at least 25 or 30 torpedo boats, of strong construction, of from 90 to 160 tons; 150 others, somewhat less powerful or older. These constitute, with the high freeboard ships of obsolete type, the defensive element of the naval force. Taken together the 70 seagoing vessels have a remarkable homogeneity of strategic qualities; speed not inferior to 16 knots (since the repairing of the *Duilio* and *Dandolo*), easily raised to 18, 19, or even 20 upon many of the vessels; the radius of action not below 4,000 miles at 10 knots, in many cases double. For a fleet of a certain power placed in the middle of the Mediterranean, 4,000 miles represents a large radius of action, since only 1,800 miles separates Port Said from Gibraltar. Have the Italians foreseen that their fleet can go to the Channel or to the North Sea more closely to unite its operations with those of a faithful ally? Why not? This fuel capacity, somewhat great, considerably augmented by the use of petroleum, seems here to furnish an interesting indication. In any case it can be seen that one of the most clearly marked characteristics of this fleet is mobility. "War is mobility," said Napoleon. Our neighbors have not forgotten it. If now we examine the tactical qualities of the Italian ships we will notice at once the rupture of the classic equilibrium between defensive armament, reduced to a minimum, and offensive armament carried on the other hand to the highest possible degree of power. Since 2 of the larger units admit with the water-line belt only an armored deck of 76 millimeters (1.93 inches); since 8 battleships or armored cruisers, the most recent and the best, have a vertical armor of only 10 centimeters (3.9 inches), intended to burst Melinite shells upon striking, or if they employ an armored belt on the line of flotation, not adopting thickness greater than 15 to 25 centimeters (5.9 to 9.8 inches), and then only over a small area; finally, since the 5 other units, comparatively old, carry thick armor only in the center to defend the motive power; the battery, the torpedoes, and the secondary battery, always of the newest and most perfect models, represent, on these fine ships, a greater fraction of the total displacement than in any other navy. As for the ram, the Italians have taken care not to forget what service this terrible weapon can render to whoever makes use of the mass to pierce armor, hull, and compartments; of speed, to approach the adversary at will; of manœuvring qualities, to overcome the efforts of any vessel seeking to evade the blow that menaces it. The larger Italian ships manœuvre, as those say who have seen them enter narrow harbors, with much greater facility than could be expected from such large ships, and if, perhaps, their tactical diameter is large, the time required to complete a circle is very small. One can see that the Italian fleet amounts to something. Must one, then, admire it without reserve, and declare that its finest specimen, the *Sardegna*, is without fault; above all, an offensive ship? Under no circumstances.

It is a strange thing that well-instructed men and profound thinkers have not more highly appreciated the importance in strategy of the number of units as much as their cost in the financial budget; that they have not tried to create types as offensive but less gigantic, and consequently cheaper and of a more easy repetition, for a country whose wealth is more modest than its ambition. Without doubt they would have arrived there, as they soon will,[1] by rejecting the too costly and much-discussed monster cannon with the same energy as gigantic battleships, and also in persevering in the direction indicated by the *Duilio*, the lowering of freeboard. What should be opposed to this fine squadron, which, joined by the active Austrian division, will comprise 18 battle units, 18 cruisers or powerful scouts, 16 light scouts, and 35 or 40 seagoing torpedo boats? Forces evidently very nearly equal, for here it would be temerity to count upon a cooperation, at least immediate, of the Black Sea fleet. We must no longer deceive ourselves that the feeble squadron maintained by Russia in the Mediterranean has a very permanent character; but that it appears above all to play the rôle of reserve for the fleet in the extreme East. Consequently we must oppose 18 battleships, 18 scouts, 8 torpedo vessels at the least, and 36 seagoing torpedo boats, a total of 80 vessels, to the 80 or 90 eventually available for our adversaries. Shall we say oppose? But how to oppose a fast squadron with one inferior in speed, particularly when the former sees it to its interest to shun the tactical solution and refuses battle? For this must be the case for the allies, who well understand that if the decisive ship-to-ship battle results in our favor, and to claim this does not indicate too much presumption, we would be free, being masters of the sea, to undertake a series of operations very injurious to them and exercising a sensible result upon the general solution; or to be at liberty to send to northern waters forces capable of commanding them without contest.

Thus we can be assured that they will always evade decisive action as long as we are not in a position to impose upon the adversary this strategic principle: above all things to seek out and fight the enemy's organized forces. Thus speed at a minimum of 19 knots for the larger battle units and of 20 for some of them seems plainly the indispensable condition of the efficiency of the French naval force in the Mediterranean. As well as number and speed, radius of action, the third strategic characteristic, will have a considerable influence upon the operations of war, which scarcely can extenuate the organization, very desirable where it concerns us, of a regular service of provision boats and colliers. This service must then be established with great care, and it is not a good idea to take for a base of supplies an arbitrary distance steamed at 10 knots. People seem to forget that a fleet, once its object attained, must traverse in an inverse sense to return to its base the route which conducted it to this objective, and finally that it will be extremely dangerous for it to appear before its port, at the entrance to which a hostile force may be waiting, with empty bunkers. Besides, the speed entering into this calculation is entirely insufficient. Cruising speed of a modern fleet will be nearer 14 knots than 10. Besides, it is impossible to neglect, particularly in war time, the sensible expenditure which results from the use of auxiliary boilers and engines, independent of the motive power, by means of which the working of batteries, electric lighting, various hydraulic gears, windlasses, capstans, etc., is carried on. We shall come nearer to the reality and arrive in a more direct manner at the military necessities by laying down the following conditions to determine the fuel outfit:

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[1] *L' Ammiraglio di Saint-Bon* and *l' Emmanuele-Filiberto*, the new Italian battleships, have guns not exceeding 25 centimeters instead of 34 (13.39 inches); of 25 tons weight instead of 69. As the turrets protecting this new battery have a thickness of only 250 millimeters (9.84 inches) instead of 450 (17.72 inches); that besides this all training machinery, carriages, frames, etc., as well as the ammunition, will undergo a corresponding reduction of weight, the total economy is at least 1,200 to 1,500 tons. The *Ammiraglio di Saint-Bon's* displacement is not above 9,800 tons, instead of 14,000, while the thickness of the armor has been increased in the midship part of the vessel; but, on the other hand, the speed has fallen to 18 knots. With 1,600 tons more displacement 20 knots could have been retained without rising to 12,000 tons, the displacement of our *Carnot*, *Jaureguiberry*, etc.

(1) Power to cross the Mediterranean each way, from Oran or Toulon to the Dardanelles, at 12.5 knots, or to go from Toulon to Dunkirk at 14 knots. This supposes a consumption for the first case of about 1,000 tons, for the second case about 800 tons.

(2) To maintain in use all the auxiliary machinery. This requires an expenditure of from 120 to 150 tons in the ten days of the double trip through the Mediterranean.

(3) A reserve of at least 100 tons. Total, 1,200 tons of coal.

One thousand two hundred tons of petroleum would be worth more from the differnt points of view of efficiency, space occupied, and rapidity of stowage; above all, this would eliminate, as nothing is to be done but turn cocks to feed the fires, the rapid overworking of the firemen and coal heavers. Nevertheless, whatever military advantages may be expected, the exclusive employment of petroleum has not yet been reached in our navy. Who would dare to close one of the principal employments of national coal? If the moment had not come to remember that the Mediterranean is the most favorable field of trial for the seagoing monitor, where the protection against the adversary's artillery will be demanded above all by the lowering of the vertical target, to the great benefit of its military value and the reduction of net cost of the fighting unit, we would have nothing to change in what has been said above in regard to the tactical qualities and to the predominance which it is necessary finally to give to the offensive organs, the arms on the defensive units, or at least upon the heaviest and the most costly, the armor clads. Here it is not a question to develop an idea already familiar to many sailors and engineers, partly realized in the *Monterey* and the *Katahdin* of the new American Navy. At another time we never would have permitted ourselves to be passed by anyone in this fertile field; we would have tried to solve all problems, undoubtedly intricate, which this idea raises, and we would have solved them. Is it then true that henceforth, reduced to imitate, we are ready to resign ourselves to follow behind the type, far from being in advance of it?

V.

The offensive, to be serious and durable, must depend at the beginning of the forward movement upon a solid primary base, and, successively, as the naval force progresses upon fortified posts, secondary bases where are collected the most indispensable necessities for refitting the units of combat. The far-seeing and tenacious policy of England, served by a diplomacy whose intrigues are always aggressive at bottom, if not in their form; this traditional policy triumphs in the art of preparing, during peace, the guides of the natural grand lines of operations for her fleets. One can admit, however, the power to create these series of repairing stations during the first movements at points seized, such as islands, in the enemy's territory. Besides, it is necessary that the elements of this system must be prepared in advance, and notably that account must be taken of what special forces the defense of each echelon shall be confided to. But we shall exceed the limit set if we allow ourselves to be seduced by the interesting subject of the organization of maritime bases. Let us take up to-day only that which touches upon the logical composition of our fleet; that is to say, the organization of the maritime mobile defense of the French littoral and its adjuncts—Corsica, Algeria, Tunis, and foreign colonies. After long discussion, resounding and passionate, people have finished by agreeing upon the value of torpedo boats as engines of coast defense. Still better, torpedo boats, formerly so much despised, have succeeded in making for themselves an honorable place, as we have just seen, in active fleets, in seagoing naval forces. It is true, to obtain this result they have been compelled to give up the benefit which was considered to be the most essential to their success—invisibility. The quality of high speed more surely obtained, longer maintained through a sensible increase of their tonnage, has sufficed to open the eyes, even of the blindest. The services which they can render as bearers of dispatches, couriers of high speed, in the numerous cases where the state of the sea is not opposed to the development of their powers, have been well recognized. While not as fine as the seagoing torpedo boats, the coast torpedo boats of the first class (80 tons instead of 120 or 150) are not less good war instruments, well adapted to the service required, and with which one would not hesitate to go to sea to conduct an active defense, the best and most efficacious. It is hardly doubtful that an admiral, returning to his base of operations with seagoing torpedo boats thoroughly fatigued, would not consider himself satisfied to be able, temporarily, to replace the one by the other. One can not say as much of the second-class torpedo boats, which, sensibly weaker (45 to 50 tons), must be left to their defensive rôle. But in any case, what should be the number of these coast-torpedo boats of the two classes? Are there any logical grounds from which to determine this? Let us suppose a naval force observed from near by by the enemy, even blockaded; while it refits at the anchorage which serves it as a base, that there it recuperates, that there it repairs its motive power and cleans its boilers. To the active and mobile elements of the maritime defense belongs the duty of assuring to this fleet a relative security; it is the duty of the coast-torpedo boats particularly to keep the enemy as far off as possible, to impede his approach under cover of darkness, which paralyzes coast defenses and enables him to rain projectiles upon the anchorage, the ships, and the establishments ashore. Such an operation, an unexpected and nocturnal bombardment, which has nothing in common with the systematic and calculated bombardment of a regular siege, can not be undertaken except by a division, relatively feeble in number, of a hostile naval force. The enemy can not, in truth, pass his nights at the entrance to the harbor and keep his boilers in good condition without using prematurely all his means of action; he will retain in reserve at least half his effectives, either at anchor in the neighborhood of the base or at sea under easy steam. Let us admit that 4 battleships and a corresponding number of light vessels are detailed each night for the operation under discussion. One can not allow less than 12 first-class torpedo boats (3 to an ironclad) to oppose this by attacking with some hope of success the powerful units of this division. Besides, it is clear that these torpedo boats will need rest every other night; hence the necessity to allow 24 to the base or even 30 to guard against accident, injuries, and the divers chances of war. While the torpedo boats attack the adversary's battleships some stonger vessels must contain the light ships; this is the rôle of the divisional avisos, and we must allow either 4 or 5 of them to a flotilla of 30 torpedo boats. If the engagement draws near the base and our vessels are beaten, or if the engagement prolonged to daybreak brings in the enemy's reserves, it will become necessary, and without need of the intervention of coast batteries, to send upon the field of action powerful and solid elements capable of supporting, gathering up the flotilla, and protecting its retreat with guns or, if needed, with the ram. Behold the coast-defense vessel in action! Indeed, this engine, par excellence, of defense is not wanting to our fleet, unhappily defensive in its entirety, with which events, circumstances and men have endowed the French navy.

In the too-variegated assortment of our war ships this type is represented with such abundance that there would be room for astonishment in spite of all, if one did not remember that at the moment a program of new construction (soon forgotten) is prepared with the assent of the Chambers, every minister, embarrassed concerning the choice of new construction, falls back upon a coast-defense vessel. Thus it is that we have 22 of them (including armored gun vessels) displacing 100,000 tons, while Germany, for a long time and justly, preoccupied with defending herself upon the ocean, has but 17, of whom 11 are old gun boats which she is going to let disappear without even thinking of replacing them; while England has but 2 and Italy none; but the worst of it is that 9 of ours are relatively recent, and that the last 4, of the types *Valmy* and *Trehouart*, have just entered service. Without doubt their seagoing qualities and their relative speed have caused them to be put in the category of battleships, but it is sufficient to state that their coal capacity assures them only 1,700 miles at 10 knots, in order to prove their inaptitude for offensive operations, which are, or ought to be, the proper rôle of active fleets. Therefore it is said if the coast-defense vessel, in so far as it is a coast-defense vessel, has its place marked out among the necessary elements of the mobile defense of a base, is it not logical to build some of them? Perhaps, while consulting only pure logic, but we have other things to think about; we must consult our budgets and our resources. When one's resources are limited, to devote 130,000,000 francs in thirteen years to 9 vessels, absolutely special, is to expose ourselves to the reproach of making bad use of public revenue, and this reproach appears to be more justifiable when one reflects above all that antiquated units of combat, unserviceable for war abroad, will retain for a long time a value sufficient to guard in a close defense the neighborhood of bases, to prolong, by resting themselves upon the support of the guns, the action of coast batteries. This is well understood in England, where all the coast-guard and port-guard vessels are old battleships; in Italy, who utilizes as central ships of her mobile defense what are left over from Lissa; in Germany, who, changing her mind as we stated above, has made of the *Siegfried* type a seagoing ship by increasing its radius of action, and retains her old battleships as *Hafen-Schiffe*. However it may be, we are not wanting in coast-defense vessels. In resigning ourselves to the definite merging of the 9 ships of which we have just spoken into the active fleet, we still have 5 coast defense-vessels, 8 armored gun vessels, 4 battleships anterior to 1877, and 4 *cuirasses de station* even older, which never would be sent far away; total, 21 units. More than necessary. Let us see how many coast torpedo boats we need, and for this purpose let us count our bases. In the north the three principal ones, Dunkirk, Cherbourg, and Brest, will be sufficiently provided with 30 torpedo boats for each of the first two and 25 for the third. In the west, Lorient and Rochefort—good factories, but as military positions actually but little menaced—will be content each with 10 torpedo boats. Toulon, our only principal base on the French littoral of the Mediterranean, not without grave inconvenience, will require 30; Oran, Bizerta, Ajaccio, and Bastia, secondary bases as general plant, but very important from the strategic point of view, will require 15 or 20; total, about 210. Let us add to this about 90 to constitute local defense at commercial ports, which considerations, somewhat removed from exclusive and perhaps serious military interests, will not permit us to deprive of all mobile maritime defense. Finally, the six bases of operations in foreign seas—Dakar, Fort-de-France, Diego-Suarez or Bourbon, Saigon, Noumea, and Tahiti—will require 50 or 60. Thus we arrive at a general total of 360 torpedo boats, probably 200 first class and 160 second class. This block of 360 torpedo boats must be divided into 60 squadrons, to each of which theoretically must be assigned an aviso, chief of the group. Sixty avisos is a large number, and, as we shall see, it is necessary to limit our demand; 30 may suffice, provided the distribution admitted favors the essential bases—Dunkirk, Cherbourg, Oran, Toulon, Bizerta, and Bastia; provided, also, that displacement is not tampered with; 500 tons will not be too much to obtain 25 knots, fully loaded, and a respectable battery. That the presence of a submarine torpedo boat in the anchorages of our war ports will be of a nature to inspire much circumspection in a blockading fleet and oblige it to increase by many miles the zone of active observation is what nobody will deny. The moment is near at hand, without doubt, when in spite of all obstacles we can count upon the services of these engines for the defense of our bases of operations. Their adaptation to the offensive soon will follow. In the examination of the rational composition of the French fleet flowing from exterior political circumstances it remains to examine what elements should be assigned to the protection of our commercial marine or to the destruction of the enemy's mail steamers. Of these two duties the first will be but too easy; to speak of the second is once more to raise the question of cruiser war, already so much debated. Happily, we can dispense with touching upon a subject which has been treated here only a few months ago. Moreover, in spite of the able diversion of England, all the maritime nations, and France among them, have decided to enter a path which was opened about ten years ago, so that the era of sterile discussions seems ended. On the other hand, if up to this moment we have not admitted into this study more than the general hypothesis of a conflict with the Triple Alliance without preparing resources demanding the best possible employment against Great Britain, we can anticipate upon this special point of cruisers, since it concerns types of which the putting into use aims above all (it would be puerile to hide it) against the most powerful marine of the whole world. Let us see, then, what we require in the case of an Anglo-French duel; the calculation is very simple:

(1) Four divisions composed of 1 cruiser of 4,000 tons, *Descartes* type, and 3 cruisers of 2,000 tons, *d'Estrées* type, for the China Sea, the Indian Ocean, the Pacific, and the Antilles, there to ruin the enemy's commerce, to menace his maritime stations, if necessary to ransom them, and at the same time to cover our own. Vastly inferior in number to their adversary, these divisions must have the advantage of speed and radius of action.

(2) Eight large corsair cruisers for the North Atlantic, 2 alternately cruising or refitting upon the routes of navigation converging toward England (St. Lawrence, channel of the north; New York, Queenstown, Bahama Channel, Bahia, Cape Verde, Cape Finnisterre, Ushant). These cruisers will be vessels of from 10,000 to 12,000 tons, having for weight of combustible about one-quarter of their displacement and a speed of from 23 to 24 knots.

(3) Two other large cruisers, but of 8,000 tons only, for the North Sea. Like the preceding ones, these vessels to have a speed which will permit them to escape from the English cruisers *Powerful* and *Terrible*—let us say at least 23 knots.

VI.

Let us recapitulate the different active elements of the military marine force thus logically constituted, and, approaching the financial question, let us endeavor, by the comparison of the elements of this ideal fleet with that of the actual navy, to discover the effort which it will be necessary to ask of the country. For the working force to the north and south we have deduced 32 battleships or large armored cruisers of a total of about 300,000 tons; 28 scouts, of 84,000 tons; 12 torpedo vessels and 56 seagoing torpedo boats, of about 18,000 tons.

For coast defense, 30 torpedo vessels, say 15,000 tons, and 360 coast torpedo boats of the first and second class, say 25,000 tons. As for coast defense vessels, it is understood that these are to be obsolete battleships. No navy will be without them, ours less than any other, since they have existed only twenty years.

For exterior operations and the capture of mail steamers, 26 cruisers of different types, displacing 176,000 tons. Thus we arrive at 618,000 tons, to which it is well to add 24,000 tons for 4 squadron depot ships, refitters of the light units, like the *Foudre*, now in service. Everything included and rounding off a little, 650,000 tons. It goes without saying that we neglect all auxiliary naval adjuncts—transports—which can be replaced by mail steamers, of which we possess enough and plenty; school ships, training ships, towboats, lighters, powder boats, tenders, etc.; finally, gunboats, side-wheel and screw dispatch boats, launches, vedettes, and other small vessels for service on interior waters and in foreign countries. Six hundred and fifty thousand tons of shipping having a real military value and capable of playing a weighty part in the conflicts that menace us. This is what we must have. What have we in reality, even counting the units building? Nineteen battleships, of a mean tonnage of 11,000, and 1 large armored cruiser of 6,800 tons, making a total of about 215,000 tons of displacement. If merely provisionally and by an unfortunate surrender of principle we admit the 9 coast-defense vessels referred to above in the fighting force, these coast-defense ships called offensive, we will arrive only at 275,000 tons; 27 scouts, among which are to be counted 5 small armored cruisers of the *Charner* type; total, 88,000 tons; 11 divisional avisos and 40 seagoing torpedo boats; total, 17,000 tons. Here we accept as divisional boats 8 vessels officially styled counter topedo boats, 4 of the *Faucon* type and 2 of the *Levrier* type, but whose speed is totally insufficient. We insist that this is only a provisional utilization. Eight torpedo vessels of low speed, displacing 3,000 tons, and 190 coast torpedo boats, displacing about 11,000 tons; total, 14,000 tons; 13

cruisers, of which 3 are obsolete, and of which only 2, still under construction, the *Guichen* and the *Chateau-Renault*, approach in any degree to the conditions of cruiser warfare in the North Atlantic. These 13 vessels displace 78,000 tons; 1 squadron depot ship, the *Foudre*, of 6,000 tons. Thus all reservations made upon the provisional utilization which we reproach ourselves for having made already, the French fleet of 1898 represents 480,000 tons of fighting vessels instead of 650,000. Thus we have 170,000 tons to construct with the least delay possible, that is to say, in four years. Nevertheless, instead of 170,000 tons it would be wise to allow for 200,000 tons, owing to the eliminations which will be made during these four years from the fleet in the first line. Well, by what figures is the corresponding financial effort to be deduced? Two hundred thousand tons at 3,000 francs a mean ton (the battleship ton and the *Corsair* cruiser ton will not be much greater than 2,300 to 2,400 francs, but the torpedo ton will amount to 5,000 or 6,000), this makes 600,000,000 francs. It will be indeed wise to take account of an inevitable increase of price of all materials necessary in naval construction, unless as an exception and in favor of a national interest well ascertained, Parliament authorizes the administration of the marine to make use of the resources of the large foreign machine shops.[1]

In any case one can legitimately, to balance this increase, take account of a certain diminution of the net cost per unit if, as there is reason to hope, well conceived and well studied types frequently will be repeated. Now in regard to our 600,000,000 francs. Without doubt the total is large, but the fact must not be lost sight of that each year about 80,000,000 is entered in the construction budget, which in four years amounts to 320,000,000. Thus but 280,000,000 will be required from extraordinary budgets, in fact only about 200,000,000 if we add one year to the four-year term proposed above, because this is the minimum delay required by the preparation of plans and the construction of a large fighting unit. It is necessary to observe that this charge, certainly very heavy, of 200,000,000 to 280,000,000 will be sensibly reduced if we devote each year less important sums to the repair of obsolete vessels; that it will be much better to leave them, such as they are, to their natural rôle of reserve or coast defense vessels, and to the innumerable alterations (travaux de modification) inflicted, most frequently without necessity, upon the ships building or already in service; but this leads us too far, and besides we can not avoid noticing the normal and very legitimate augmentation which logically must result to certain chapters of the ordinary budget from the extraordinary increase of the fighting fleet. It is clear, for example, that more men will be required, increase of war material, increase of certain storehouses, rearrangement of moorings, ports, docks, etc. Definitely we can not think of expending less than about 250,000,000 in works paid for by special budget; and we shall esteem ourselves happy if after all balances are struck between the inevitable increase and the reductions realized from the ordinary budget, this increase will not exceed in the future the 240,000,000 granted for 1897 to the naval establishment (services marine). Here let us examine with what resources it will be best to meet this expenditure of 250,000,000 spread, one must not forget, over four or five years, which will much exceed our allowance. We desire to say, and without ignoring the real financial difficulties, that France is not yet ready to refuse the necessary appropriations to her navy at the moment when she is reconstructing her colonial empire, torn apart last century; at the moment when upon the European continent compact masses oppose barriers more and more solid to her expansion; when, besides, the axis of general politics is moving toward the east, and when with a unanimous enthusiasm all nations turn toward the sea to ask of it the secret of riches, prosperity, and military power.

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[1] This call will be necessary from other points of view. It is doubtful if our forges and factories will be able to furnish in four years steel plates, shapes, armor plates, or built-up parts of all kinds, such as boilers, machinery, gun material, etc., that will be necessary. Above all, it is not doubtful that this supply, "intense," so called, will do no injury to interests of commercial construction, and already in the Parliament reserves have been asked for by the representatives of the ship owners.

VII.

This rude pursuit of supremacy upon the sea is indeed a spectacle which merits the attention of the observer. All seek it, some wish it entirely, well understanding that supremacy upon the ocean also is supremacy upon the land. Others, with an ambition for the moment less vast, but just as tenacious, will content themselves with the basin which they occupy in the center and which was obedient to their ancestors. These, have oceans of their own which are their zones of influence; those, territorial seas jealously reserved. Some dominate with pride over straits where all pass on artificial arms of the sea, where all pay; and in this universal passion for the element, which is at the same time the highway of material interests, the connecting link between peoples and the eternal vehicle of civilization, have disappeared the last two of the five conditions laid down at the beginning of this study; these two conditions which formerly appeared essential, financial strength and the natural faculties, instinct, sea-sense.

What is financial strength? Certainly it is this which permits England to expend in ten years two milliards and a half to double her fleet; the United States to create one in a few years; Germany quickly to pass from the fifth or sixth rank to the third, while awaiting a higher one, in spite of the weight of her military charges. But if this condition is sufficient, it seems no longer necessary, thanks to the national loans always subscribed to through able intermediaries among rich nations who either do not know or dare not employ their capital at home. Where is the government so poor, so repudiated as to see itself refused here—in devoting to the necessity the product of a tax, a monopoly or the customs of any port—the wherewithal to order battleships, cruisers, or torpedo boats at New Castle, Glasgow, Stettin, Elbing, Sestri-Ponente, or Leghorn? At Havre or la Seyne let us add, willingly, if this windfall was not rare for those who become at their own risk and peril benevolent money lenders to the nations involved, what of the natural faculties of the race, the sea sense? Who occupies himself with this? It is necessary to have a fleet well or badly managed. The Chinese had one; they lost it; they are getting a new one. After all it is not certain that they are wrong. This instinct of the sea, an innate faculty of some, will it not become an acquired faculty for all the others? Have not the Russians made in this direction astonishing progress in two centuries; and who would have dared predict thirty years ago that Germany would give offense to England by the sudden impetus and the rapid increase of her commercial fleet? Here also we can see after a long torpor the Spaniards again becoming sailors. In a few years the fleet of our southwestern neighbors will retake the rank held when she struggled with us against the oppressors of the sea, when she disputed with them the Mediterranean and the Balearic Islands, the seas of the Antilles and of Colombia, from 1739 to 1748, from 1779 to 1783. Be not deceived. It is this fleet born again, and already strong, also ably composed of offensive units and of rapid ships, which inspires a wise reserve in a certain government upon the Cuban question. Let us applaud this vigorous flight of the Spanish navy. Let us felicitate ourselves on this new budding of the maritime spirit in a proud and energetic people, astride, like us, upon the ocean and the Mediterranean, that knows well that it must command the point of junction and that never will forget the insult of Gibraltar.

To recapitulate. What is the spirit (l'etat d'ame) of the nation, face to face with matters pertaining to the sea? Does it interest itself in these things in reality? Does it appreciate the importance, and, apart from some speeches where nothing is said that should be said, while repeating to satiety that about which silence should be maintained, does it resolutely manifest, as do all other nations to-day, the will to have a powerful navy or only the navy of its power? A delicate and difficult question, to which we replied implicity at the beginning of this study. What, then, are the essential factors of what we have called the maritime spirit? Of what tendencies, of what qualities, perhaps even of what happy defects, is it composed? Is it not exactly of that liberal enthusiasm, of that spontaniety of decision, of that love of distant and adventurous enterprises, tenacious and encroaching actions; in a word, of those pacifically offensive faculties, always tempered by our humanity, by our cordial good humor, which formerly we possessed to such a high degree and which during a hundred years are becoming enfeebled, destroyed, and are disappearing? Let us beware. If it is indeed from these sources that the maritime spirit is nourished—if it is from all this that the force of expansion of a great people is made—it is all this also which sustains and vivifies its navy—one of the principal elements, and finally perhaps the principal factor, of the nation's power. To construct vessels, and offensive ones, is well enough; that which is better is to be able to confide them to the men who know the price of audacity—the price of those bold initiatives which conquer fortune in disconcerting the adversary. To-day without doubt we have these men. Will we always have them? Can it be imagined that in a nation where the verile qualities of which we spoke a little while ago are decaying, will it be possible, if the people do not react promptly, very long to assure to the navy an inflow of exceptional characters?

OFFICE OF NAVAL INTELLIGENCE,
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NOTES ON SHIPS AND TORPEDO BOATS.

By Lieut. H. F. Fickbohm, United States Navy, *Staff Intelligence Officer*.

ARGENTINA.

TORPEDO BOATS.

SANTA FÉ, 250-TON TORPEDO-BOAT DESTROYER.

The Santa Fé, built by Yarrow in 1896, was wrecked on the reefs of Colonia; the guns and boilers may be saved.

AUSTRIA.

VESSELS PROPOSED.

Three coast-defense vessels, one cruiser, and six torpedo boats.

VESSELS LAUNCHED.

JAGUAR, 2,300-TON TORPEDO CRUISER.

This vessel was launched about February 1, 1897.

Dimensions.—Length, 301.8 feet; beam, 42.6 feet; mean draught, 14.1 feet; displacement, 2,300 tons; I. H. P., 7,800; speed, 20 knots.

Armament.—Eight 4.7-inch R. F. guns, ten 47-millimeter, two machine guns, and two torpedo tubes.

TORPEDO BOATS.

The Austrian Government has placed a contract with Messrs. Yarrow & Co., of Poplar, for four first-class torpedo boats of the improved "Viper" type.

BRAZIL.

STEAM TRIALS.

ALMIRANTE BARROZO, 3,450-TON PROTECTED CRUISER.

(Page 18, No. XV; 8, No. XVI, Part I; 23, No. XVI, Part II.)

This vessel, which has been reported as sold to Japan, had her steam and gun trials on the 29th and 30th of April, 1897, which are reported as satisfactory. In the natural draft trial of six hours' duration a speed of 19.5 knots was easily maintained. The forced draft trial gave a mean speed of 20.5 knots, which was also kept up with ease, and was half a knot in excess of the contract speed.

VESSELS COMPLETED.

TIMBIRA, 1,030-TON TORPEDO VESSEL.

(Page 14, No. XIV; 18, No. XV.)

This vessel, built at Kiel by the Germania Company, has been delivered to Brazil.

Rig.—Two military masts, each carrying a small signal yard below the tops. The military tops have high rims, and each contains an automatic 37-millimeter Maxim-Nordenfelt gun. Each mast has a small platform for search lights. Draught is 13 feet with coal and provisions aboard.

Armament.—Two 4-inch Armstrong R. F. guns, one on topgallant forecastle and one on poop; six 57-millimeter Maxim-Nordenfelt; four 37-millimeter automatic, and two Maxim machine guns. The machine guns are placed at the extremities of the forward bridge and have a fire ahead and astern. The two 37-millimeters not in tops are on what resembles an after bridge; they fire astern to about 10 degrees from each bow. Two 57-millimeters are mounted on topgallant forecastle, the other four in broadside.

There are three above-water torpedo tubes and six Whitehead torpedoes; the bow tube is fixed, and the broadside tubes train by hand to two points from bow and stern. The torpedoes can be discharged from the conning tower by electric connections. Powder is used, but a compressing outfit for firing with compressed air is fitted. There are two search lights, one on foremast and one on mainmast, movable, and can be controlled and moved electrically from forward bridge.

There are two vertical, inverted, direct-acting, triple-expansion engines with double low-pressure cylinders.

There are five locomotive boilers of steel, with copper fire boxes, arranged in three compartments in fore and aft lines, two in each of the after compartments and one in the forward compartment. Forced draft is on the closed fire-room system. The working pressure is about 190 pounds per square inch. The boilers and engines have 60 inches of coal protection. There are two 3-bladed twin screws, protected by booms in port. Coal capacity at load-water line, 260 tons. Maximum speed, 23 knots, with an average of 22 knots for eight hours. There are twelve water-tight compartments, four of which are for the engines and boilers. The bulkheads extend up to the decks. The conning tower is forward of the foremast, and raised slightly above the topgallant forecastle. There are two smokestacks. There are no projections on the sides except the sponsons for the 57-millimeter guns. Two similar vessels are building at the Germania Works, Kiel.

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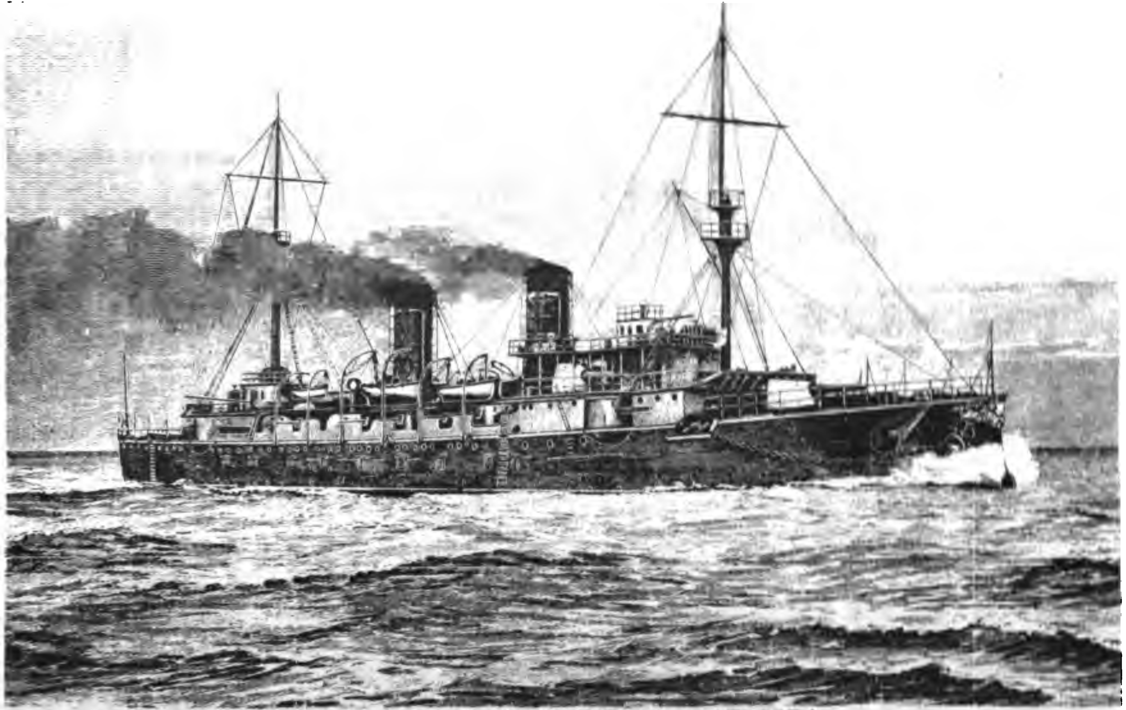


FIRST-CLASS CHILIAN CRUISER ESMERALDA.

CHILE.

VESSELS LAUNCHED.

O'HIGGINS, 8,400-TON ARMORED CRUISER.

(Page 21, No. XV.)

This vessel was launched May 17, 1897, by Armstrong, Whitworth & Co., Elswick. She is sheathed and coppered and has a ram bow. The four 8-inch guns are placed in 6-inch steel barbettes, the casemates are 6 inches, the conning tower 9 inches, and the protective deck from 2 to 1.5 inches thick. Two triple-expansion engines and Belleville boilers to develop 16,500 I. H. P.

VESSELS COMPLETED.

ESMERALDA, 7,000-TON ARMORED CRUISER.

(Page 21, No. XV; 24, No. XVI, Part II.)

This vessel has been completed by Sir W. G. Armstrong & Co., at Elswick, for the Chilean Government. Her full coal supply is 1,350 tons, which would enable her to cross the Atlantic at a speed of over 20 knots, and gives her a large radius of action at moderate speeds. She is sheathed with wood and coppered.

Armament.—Two 8-inch R. F. guns, placed one forward and one aft; sixteen 6-inch R. F. guns, four firing right ahead and four right aft, and the remaining eight in broadside; eight 12-pounder R. F. guns; ten 6-pounder R. F. guns; four Maxim guns, and three torpedo tubes. Her official steam trials took place in September, 1896, and consisted of a full-speed trial with natural draft, which lasted for six consecutive hours. During the trial, runs were taken on the measured mile, and a mean speed of over 23 knots was obtained with and against the tide, and the H. P. which gave this speed was maintained, and part of the time exceeded, during the six hours. In addition to the above an endurance trial was taken, lasting twenty-four hours, during which three-fifths of the full power—namely, 10,800 H. P.—was maintained, giving the vessel a speed of over 20 knots per hour.

The gun-firing trials took place off the Tyne December 16, 1896, the guns and structure of the ship being put to the severest possible tests. The 8-inch gun and four 6-inch guns were fired simultaneously in the line of the keel and horizontally, the shot passing only a few feet above the deck over the admiral's stateroom, and yet no damage was done. All the guns were also fired simultaneously by electricity, which is also used as the motive power for training the 8-inch guns and the hoists for the 8-inch and 6-inch ammunition. The vessel is lighted throughout by electricity.

TORPEDO BOATS.—STEAM TRIALS.

CIRUJANO VIDELA AND INJENIERO HYATT.

(Page 23, No. XV.)

Two of the six 130-ton torpedo boats built by Yarrow for the Chilean Government had steam trials with a load of 25 tons. The *Videla* made 26.79 knots and the *Hyatt* 27.2 knots. They have left England for Chile. The remaining four boats are to be shipped in pieces and finally put together in Chile. The first of these four was also tested under steam in the presence of the Chilean authorities, having been completely erected and bolted together in the contractor's yard.

CHINA.

It is reported that China has under consideration a building program of five years' duration for the construction of 6 large battleships, 12 armored cruisers, 20 second and third class cruisers, and several 32-knot torpedo-boat destroyers.

FRANCE.

CONSTRUCTION PROGRAM.

The budget for 1898 has not yet been passed by the Chamber. It was reported in December last that the superior council of the marine intended to submit a program for the construction of 220 new vessels of all description, viz, 6 battleships, 22 cruisers, 7 avisos for coast service, 35 torpedo-boat destroyers, and 150 torpedo boats for coast defense and the high seas. The construction of these vessels was to be extended over a period of eight years, and to cost 800,000,000 francs. The council, however, has not asked the Chamber to decide upon the whole of the program. It is asking instead for a supplementary credit of 80,000,000 francs, of which 8,468,727 francs is to be included in the present budget to permit of the putting in hand of 1 battleship of 12,000 tons, 2 armored cruisers of 7,500 tons, 2 coast-defense cruisers of 2,500 tons, 4 torpedo-boat destroyers of 300 tons, and 9 torpedo boats for coast service of 85 tons. All these vessels are to be completed by the year 1902.

VESSELS AUTHORIZED AND BUILDING.

JÉNA, 12,052-TON BATTLESHIP.

The dockyard authorities at Brest have received orders to proceed with the construction of a new battleship to be called the *Jéna.* She will be laid down on the slip from which the *Gaulois* was launched, and will be the largest vessel yet built at this yard.

Dimensions.—Length, 396 feet 9 inches; beam, 67 feet 3 inches; maximum draught, 27 feet 6 inches; displacement, 12,052 tons; speed, 18 knots; maximum I. H. P., 15,500; normal coal storage, 820 tons; radius of action at 10 knots, 5,200 miles.

The *Jéna* will have three screws, steam being provided by twenty Belleville boilers, which will be fitted to burn either coal or petroleum. If necessary, she will be able to carry 1,100 tons of coal, giving her a radius of action of 7,000 miles. Protection will be afforded by a complete water-line armor belt, with light armor over the other works, and two armored decks. The thickness of the armor has not yet been settled. The armament will consist of four 30.5-centimeter (12-inch) guns in two turrets, one forward and one aft; in a central battery between the turrets will be eight 16-centimeter (6.3-inch) R. F. guns, four firing from the beam to right ahead and the other four from right astern to abeam; above on the superstructure will be eight 10-centimeter (3.9-inch) R. F. guns similarly disposed for end on to beam fire; there will also be sixteen 3-pounders, five 1.5-pounders, and thirteen 1-inch machine guns with six torpedo tubes.

INFERNET, 2,413-TON CRUISER.

The Société de Chantiers et Ateliers de la Gironde has undertaken the construction of a cruiser of the third class to be called the *Infernet*, of the *D'Estrees* type (p. 27, No. XVI, Part II). The *Infernet* is to be sheathed and coppered.

Dimensions.—Length, 311.6 feet; beam, 39.4 feet; draught, 17.7 feet aft; with a displacement of 2,413 tons.

Two triple expansion engines of 8,500 H. P., designed to give a speed of 20.5 knots. Twin screws. At moderate speed she will have a steaming radius of 8,000 miles.

Armament.—Two 5.45-inch R. F. guns, four 3.94-inch R. F. guns, and eight 47-millimeter.

DÉCIDÉE, 613-TON GUNBOAT.

A gunboat similar to the *Surprise* (p. 23, No. XIV) is to be built at Lorient.

VESSELS LAUNCHED.

LAVOISIER, 2,300-TON CRUISER.

The third-class cruiser *Lavoisier* was launched at Rochefort on April 17, 1897. Her dimensions are as follows: Length, 330 feet 2 inches; beam, 35 feet 1 inch; draught, 17.9 feet.

The hull is of steel and not sheathed. There are two masts and two funnels.

The maximum speed is 20 knots with 6,400 I. H. P.

Armament.—Four 5.45-inch R. F. guns, two 3.94-inch R. F. guns, eight 47-millimeter, and six 37-millimeter, with two under-water torpedo tubes. The large guns are protected by 2-inch shields of chrome steel.

There are two vertical triple-expansion engines to drive twin screws. The boilers are of the Bellville system. The bunkers are designed to hold 226 tons of coal, giving a radius of action of 3,000 miles. Arrangements are also made for burning petroleum.

The quarters are calculated for 11 officers and a crew of 237 men.

STEAM TRIALS.

CARNOT, 11,800-TON BATTLESHIP.

(Page 27, No. IX; 31, No. X; 20, No. XIV; 36, No. XV.)

The *Carnot* had her full-power steam trials near the Isles d'Hyères, and made a maximum speed of 18.5 knots, with a mean speed of 17.9 knots, in three runs with 16,000 I. H. P.

JAURÉGUIBERRY, 11,800-TON BATTLESHIP.

(Page 31, No. X; 48, No. XIII; 35, No. XV.)

The first-class battleship *Jauréguiberry*, which was constructed by the Forges et Chantiers de la Méditerranée, and is supplied with water-tube boilers on the Lagrafel and d'Allest system, has now finished her steam trials. These trials were commenced some months ago, but were interrupted by an accident to the boilers. The following table shows the results obtained:

	No. 1: Speed trial.	No. 2: Consumption trial.	No. 3: Endurance trial at 10,000 I. H. P.	No. 4: Consumption trial at 8.000 I. H. P.	No. 5: Consumption trial at 3,500 I. H. P.
Duration ....hours..	6	4	24	6	6
I. H. P........	13,819	13,880	10,511	8,076	3,433
Coal burned per square foot of grate area per hour ....pounds..	23	32	15	12	11
Coal per I. H. P. per hour ....do....	1.75	1.85	1.55	1.50	1.52
Speed in knots........	17.6	17.65	....	....	....

In trial No. 2 it was the intention to burn at least 30 pounds of coal per square foot of grate area, and to this end only a portion of the boilers were in use. In trial No. 5 the aim was to develop not more than 3,500 I. H. P., which is a small output for engines working up to more than 13,000 I. H. P. The excellent economy obtained in No. 2 trial, in spite of the forcing of the boilers, is worthy of note, the figure being little more than in trial No. 1.

POTHUAU, 5,360-TON CRUISER.

(Page 28, No. XI; 153, No. XII; 30, No. XV.)

The *Pothuau* had a full-power trial in February and made a mean speed of 19.2 knots with 10,398 I. H. P. Coal consumption, 1.85 pounds per I. H. P. per hour.

D'ASSAS, 3,945-TON CRUISER.

(Page 154, No. XII; 32, No. XV.)

. The *D'Assas* has satisfactorily completed her preliminary unofficial trials off Brest. During four hours' run at full speed she easily maintained a speed of 19 knots.

CHARLES MARTEL, 11,900-TON BATTLESHIP.

(Page 9, Part I, and 28, Part II, No. XVI.)

It is reported from Toulon that the four hours' full-power trial of the *Charles Martel* on May 5, 1897, was in all respects excellent. The mean I. H. P. was 14,996; the speed, 18.13 knots. Coal consumption, 1.75 pounds per I. H. P. per hour.

VESSELS REPAIRED AND REFITTING.

FORMIDABLE, 12,000-TON BATTLESHIP.

This vessel has received new boilers, and has had her 13.5-inch gun and turret amidships removed to be replaced by four 6.3-inch R. F. guns. The battery guns are to be replaced by R. F. guns of the same caliber. It is said other modifications may be necessary.

ISLY AND JEAN BART, 4,000-TON CRUISERS.

These vessels are having their military masts removed.

TERRIBLE, INDOMPTABLE, AND CAÏMAN, 7,600-TON BATTLESHIPS.

These vessels are to have an extensive refit, including modern guns.

TORPEDO BOATS AUTHORIZED AND BUILDING.

FAUCONNEAU AND ESPINGOLE.

Two torpedo-boat destroyers similar to the *Durandal* and *Hallebarde* have been ordered of Normand, at Havre. They are to be of 311 tons displacement and delivered in 1899. They are to have 4,800 I. H. P., and a speed of 26 knots, and a radius of action of 2,300 miles at 14 knots. The armament will consist of one 65-millimeter gun and six of 47-millimeter, with two torpedo tubes.

The Creusot Company has received an order for three torpedo boats to have a speed of 24 knots, and cost about $60,000 each.

Two torpedo boats of 85 tons displacement are to be built at the Toulon Dockyard, to be known as Nos. 225 and 226.

LAUNCHED.

No. 203 was launched at Havre May 15, 1897.

STEAM TRIALS.

Torpedo boat No. 201, constructed by Normand, of Havre, made a speed of 27.7 knots.

GERMANY.

NAVAL CONSTRUCTION BUDGET.

The naval construction budget for 1897–98, as finally passed by the Reichstag, authorizes a total expenditure of $9,019,010 for vessels now under construction, and three new vessels—a battleship to replace the *König Wilhelm*, and two gunboats to replace the *Iltis*, wrecked in China, and the *Hyäne*, 18 years old. For guns and torpedo supplies the sum of $2,663,934 was appropriated.

The Reichstag declined to authorize the following vessels included in the original budget: Two second-class cruisers, "*O*" and "*P*," one dispatch vessel to replace the *Falke*, one torpedo division boat, and eight torpedo boats.

VESSELS BUILDING.

"G," 2,800-TON CRUISER.

The Germania Works at Kiel has undertaken the construction of the new cruiser "*G.*" This vessel is to be much larger than the other fourth-class cruisers.

Dimensions.—Length, 328 feet; beam, 38.7 feet; draught, 16.4 feet; displacement, 2,800 tons.

The engines will be of 6,000 I. H. P., working twin screws, designed to give a sea speed of 19 knots. Coal capacity, 500 tons.

Armament.—Ten 4.13-inch .40-caliber R. F. guns, fourteen 37-millimeter and four 8-millimeter machine guns; three torpedo tubes, of which one will be under water.

The conning tower will be 2.75 inches thick, and the protective deck will be 1 inch at the side and 0.8 inch in the middle and 2 inches over boilers and engines.

There will be two signal masts. Total complement, 195. This cruiser is to be completed in 1899. The cost, exclusive of armament, is $797,300.

VESSELS LAUNCHED.

VICTORIA LUISE (EX-"L"), 5,650-TON CRUISER.

(Page 30, No. XIV; 42, No. XV.)

This vessel was launched at Bremen about April 1, 1897.

HERTHA (EX-"K"), 5,650-TON CRUISER.

(Page 30, No. XIV; 42, No. XV.)

This vessel was launched at the Vulcan Works, Stettin, about April 14, 1897.

FREYA, 5,650-TON CRUISER.

(Page 30, No. XIV; 42, No. XV.)

This vessel was launched May 11, 1897, at Dantzic.

VESSELS REFITTING.

BAYERN, 7,441-TON BATTLESHIP.

This vessel has received triple-expansion engines, water-tube boilers, and additional R. F. guns.

BADEN, 7,441-TON BATTLESHIP.

The *Baden* has received two new triple-expansion four-cylinder engines, two four-bladed propellers, and eight water-tube boilers.

The engines are of 6,000 I. H. P. The auxiliary machinery has also been renewed. A new electric-light plant of three dynamos has been installed. Woodwork has been removed wherever possible. The four funnels have been replaced by a single large one. Additional R. F. guns have been substituted, and the torpedo outfit improved.

TORPEDO BOATS BUILDING.

D 10, TORPEDO BOAT DESTROYER.

(Page 50, No. XV.)

Building by Thornycroft, on the Thames. The armament will be supplied in Germany by Krupp.

Six torpedo boats, *S 82* to *S 87*, have been ordered of Schichau, Elbing, by the German Government. The length is to be 152 feet 6 inches and the engines are to be of 2,300 I. H. P.

Two similar torpedo boats are building at the Germania Works, Kiel.

All these torpedo boats are to be finished in 1897.

GREAT BRITAIN.

ESTIMATES.

The navy estimates for 1897–98 amount to a total of $106,274,427, as against $106,201,630 in 1896–97.

NEW SHIPBUILDING PROGRAM.

In the coming financial year it is proposed to commence 4 battleships, 3 third-class cruisers, 2 sloops, 4 twin-screw gunboats, and 2 torpedo-boat destroyers.

A new yacht for Her Majesty the Queen is to be laid down at Pembroke. The design is now in hand.

Of the foregoing vessels, 3 battleships, the 3 cruisers, and the 2 sloops will be built in the dockyards; the remaining battleship, the 4 gunboats, and the 2 torpedo-boat destroyers will be built by contract. The propelling machinery and boilers for all the vessels, except for 2 third-class cruisers and one of the sloops, will be ordered from private firms.

The 3 battleships to be built in the dockyards will be laid down as soon as the slips now occupied by the *Canopus*, *Goliath*, and *Ocean*, which will be launched toward the end of the year, will become vacant.

SUMMARY OF NEW CONSTRUCTION.

Including new orders, the following vessels will be under construction or completing during the course of 1897–98: Fourteen battleships, 8 first-class cruisers, 9 second-class cruisers, 10 third-class cruisers, 2 sloops, 4 twin-screw gunboats, 52 torpedo-boat destroyers, 8 light-draught steamers for special service, and 1 royal yacht.

Thus the total number of vessels of all classes under construction during the year will be 108. Their aggregate displacement tonnage will be about 380,000 tons, and the aggregate I. H. P. about 800,000

H. P. It is anticipated that during the next financial year 66 of these vessels will be completed for service, including 50 torpedo-boat destroyers.

VESSELS BUILDING, ORDERED, OR PROPOSED.

CANOPUS, 12,900-TON BATTLESHIP.

(Page 51, No. XV.)

Keel laid January 4, 1897, at Portsmouth Dockyard. Engines building by Greenock Foundry Company. The difference in displacement between the *Canopus* class of battleships and the *Majestic* class is effected principally by the thickness of their armor belts, these being of Harveyized steel of 6 inches instead of 9 inches. They will, however, have two protective decks, the turtle-back proper, which extends from end to end, being 2 inches thick, to protect the vital parts of the ship, the main deck, instead of being made of wood, being made of two thicknesses of one-half inch steel plates. The armor in the bulkheads and barbettes will be 12 inches and 10 inches thick, and that in the casemates 5 inches thick. The armament consists of four 12-inch B. L. guns in the barbettes, twelve 6-inch R. F. guns, and thirty other smaller guns. There will be four submerged torpedo tubes, the proposed tube above water being withdrawn. The bows of the vessel are protected by 2-inch nickel steel plates, to resist the entrance of light projectiles; and the ram, like that of the *Gladiator*, is carried much higher up than in the *Majestic* class, in order to deal a more effective blow directly under the belt of an opposing ship.

The propelling machinery will consist of two independent sets of three-cylinder inverted triple-expansion engines, the diameters of the cylinders being 30 inches, 49 inches, and 80 inches, with a piston stroke of 51 inches, and which, when making 101 revolutions a minute, are designed to develop 13,500 I. H. P. Steam will be supplied by twenty water-tube boilers of the Belleville type, having a heating surface of 24,155 square feet and a grate surface of 1,035 square feet, designed for a steam pressure of 300 pounds per square inch, which will be reduced to 250 pounds at the engines. In consequence of this high pressure, the intermediate and high-pressure cylinders will be fitted with piston valves, while the low-pressure ones will have ordinary double-ported slide valves. The *Canopus* is to be completed and ready for sea in twenty months—that is, about September, 1898.

GOLIATH, 12,900-TON BATTLESHIP, CANOPUS CLASS.

(Page 51, No. XV.)

Keel laid January 4, 1897, at Chatham Dockyard. Similar in all respects to the *Canopus*. The machinery for the *Goliath* will be supplied and fitted by Messrs. John Penn & Sons, Greenwich. The *Goliath* is to be completed and ready for sea by September, 1898.

OCEAN, 12,900-TON BATTLESHIP, CANOPUS CLASS.

(Page 51, No. XV.)

Keel laid February 16, 1897, at Devenport Dockyard; the first battleship ever constructed at this yard. The *Ocean* is to be similar in all respects to the *Canopus*. The propelling machinery is to be constructed by Messrs. Hawthorne, Leslie & Co., of Newcastle. It is expected that the *Ocean* will be completed as soon as the *Canopus* and *Goliath*, although the keel was laid six weeks later.

ALBION, 12,900-TON BATTLESHIP, CANOPUS CLASS.

(Page 51, No. XV.)

The *Albion* was laid down in December, 1896, by the Thames Ironworks Company and is to be completed in August, 1899; but she will probably be ready before that date. She is to be in all respects similar to the *Canopus*.

SPARTIATE, 11,000-TON CRUISER.

(Page 51, No. XV; 32, No. XVI, Part II.)

The keel of this first-class cruiser was laid at Pembroke, No. 1 slip, May 10, 1897.

HERMES, HIGHFLYER, AND HYACINTH, 5,600-TON CRUISERS.

(Page 51, No. XV; 32, No. XVI, Part II.)

The Admiralty, acting on a suggestion from the naval ordnance committee, have decided to arm the new second-class cruisers *Hermes* and *Highflyer*, ordered from the Fairfield Shipbuilding Company, and the *Hyacinth*, ordered from the London and Glasgow Shipbuilding Company, in a manner totally different to that arranged when the vessels were designed. These vessels are to be similar in construction to the *Talbot* class, and it was intended to give them the same armament, viz, five 6-inch, six 4.7-inch, and sixteen smaller quick-firing guns; now, however, it is decided to give them eleven 6-inch, nine 12-pounder, and six 3-pounder quick-firing guns. With this armament the *Hermes* will be by far the most heavily armed of the many types of second-class cruisers, as the *Talbot* carries but five 6-inch guns, the *Arrogant* four, and the *Astræa* two. In view of the change of armament several alterations will have to be made in the designs first arranged for these vessels. Their principal dimensions, however, will be the same as those of the *Talbot*, viz: Length, 350 feet; breadth, 54 feet; mean load draught, 20 feet 6 inches; displacement at load draught, 5,600 tons. The vessels are to be built for a speed of 19.5 knots when steaming at 9,600 I. H. P. (forced draft), and 18.5 knots with the natural-draft power (8,000).

THREE 2,135-TON CRUISERS, PELORUS TYPE.

Three new cruisers of an exactly similar type to the *Pelorus* are to be laid down at an early date at Portsmouth, Devonport, and Chatham.

CRUISER, IMPROVED PEARL TYPE, 2,575 TONS.

It is reported that the Admiralty have decided to lay down a new type of cruiser during the ensuing financial year, to be known as the improved *Pearl* type. The new cruiser is to have a speed of 20 knots, and will be constructed at Sheerness Dockyard, her engines and boilers being made for her at Keyham.

TWO 1,050-TON GUNBOATS.

The Admiralty have decided to build two new gunboats on similar lines to the *Algerine* and *Phœnix.* The new gunboats will be built at Sheerness Dockyard, and will be laid down early in the new financial year.

ROYAL YACHT.

A new royal yacht is to be built at Pembroke and completed within two years. It is not intended to build her like a man-of-war. She is to be about 420 feet long and 20 feet draught. Twin screws.

EIGHT SMALL DRAUGHT STEAMERS.

The Admiralty have ordered eight steamers for river service to be built on the Thames; six by Yarrow, to be called *Heron*, *Jackdaw*, *Moorhen*, *Nightingale*, *Robin*, and *Snipe*, while two larger, built by Thornycroft, are to be called *Woodcock* and *Woodlark.*

VESSELS LAUNCHED.

NIOBE, 11,000-TON CRUISER, DIADEM CLASS.

(Page 35, No. XIV; 51, No. XV; 32, No. XVI, Part II.)

The cruiser *Niobe*, built for the British navy at the Naval Construction and Armaments Works, at Barrow-in-Furness, was launched February 20, 1897.

The hull of this ship, like that of her prototype, is, with the exception of her stem, sternpost, and propeller-shaft brackets, which are of phosphor bronze, built entirely of Siemens-Martins steel, the principal dimensions being: Length between perpendiculars, 435 feet; extreme breadth, 69 feet; depth to upper deck, 39 feet 9 inches; and displacement, 11,000 tons, at which the water draught is 26 feet.

Throughout the length of the machinery and boiler spaces the vessel is double bottomed, and beyond these, both fore and aft, water-tight flats at a lower level continue this bottom to the extreme ends of the ship. The vessel having no side armor, the protection of her vital parts is secured by a steel protective deck of arched form, having a maximum thickness of 4 inches, and running throughout her entire length. The stem of the vessel is ram-shaped, the protective deck being carried down to and effectively secured to it at the level of the nose of the ram. Bilge keels are fitted to the ship's sides for about half her length, and she is steered by a rudder of the balanced type, actuated by steam-steering engines. The plating of the hull is sheathed up to well above the water line with teak, 4 inches thick, which is covered with sheet copper. At the load draught of 26 feet the quantity of coal carried is 1,000 tons, but provision is made for about twice this amount, if required.

The armament of the *Niobe*, which is of a most powerful description, will consist of sixteen 6-inch, twelve 12-pounders, and three 3-pounder quick-firing guns, two 12 pounder boat guns, and eight .45-inch Maxim machine guns. Twelve of the 6 inch guns will be mounted in casemates on the sides, and two in the forecastle and in the poop, behind shields. Three torpedo tubes are fitted, two of which are submerged forward and one aft above the water line.

The propelling machinery, which is constructed by the shipbuilders, will consist of two independent sets of four cylinders, four cranked triple-expansion engines; the diameter of the cylinders being, high pressure, 34 inches; intermediate pressure, 55½ inches, and low-pressure cylinders, 64 inches each, all having a piston stroke of 48 inches. The high and intermediate pressure cylinders will be fitted with piston valves, and the low-pressure ones with double-ported slide valves, actuated by double eccentric and link-motion gear. The crank shafts are made interchangeable and, together with the thrust and propeller shafts, are of steel. The propellers have three adjustable blades and are designed to work inward.

Steam for the engines will be supplied by thirty water-tube boilers of the Belleville type, arranged in groups in separate water-tight compartments, and designed for a steam pressure of 300 pounds per square inch, reduced to 250 pounds at the engines. The total heating surface in the boilers is 45,900 square feet, the fire-grate area being 1,450 square feet. The propelling engines are designed to develop a maximum of 16,500 I. H. P., which it is estimated will give the ship a speed of 20½ knots.

The *Niobe* will have a complement of officers and crew to the number of 600.

EUROPA, 11,000-TON CRUISER, DIADEM CLASS.

(Page 51, No. XV; 32, No. XVI, Part II.)

The *Europa* was launched from the yard of the Clydebank Shipbuilding and Engineering Company March 20, 1897. She is similar to the *Niobe.* The vessel has four funnels, and will be rigged with two masts. She will carry a complete suit of steadying sails, and will, when finished, present a very similar appearance to the *Terrible* and the *Powerful.* The eight vessels of this class have a draught of 25 feet 3 inches, which enables them to pass through the Suez Canal.

ANDROMEDA, 11,000-TON CRUISER, DIADEM CLASS.

(Page 35, No. XIV.)

The first-class cruiser *Andromeda*, laid down January 1, 1896, was launched at Pembroke Dockyard on April 30, 1897, having therefore been only sixteen months on the stocks. She is similar to the *Niobe*, *Diadem*, and *Europa.*

PEGASUS, 2,135-TON CRUISER, PELORUS CLASS.

This vessel was launched March 4, 1897, from the Palmer Shipbuilding and Iron Company's Yard, Newcastle-on-the-Tyne. The *Pegasus* belongs to the *Pelorus* class, and is the first of two of the same class which Palmers' company are at present building for Her Majesty's Government.

The principal dimensions are as follows: Length between perpendiculars, 300 feet; breadth, extreme, 36 feet 6 inches; depth, molded, 21 feet 2 inches; displacement, on a mean draught of 13 feet 6 inches, 2,135 tons; I. H. P., 7,000; speed, 20 knots.

The vessel has two masts with a light fore-and-aft rig, and two funnels. The hull throughout is built of steel. A sloping protective deck extends the whole length of the vessel, and incloses the vital parts of the ship. The deck extends 2 feet 6 inches below the load-water line at the sides, and is formed of two thicknesses of plating in the wake of the machinery; the deck, on sloping portion, is 2 inches thick, and 1 inch thick on the level portion. The hull is divided into a large number of water-tight compartments. The magazines and shell room are situated before and abaft the machinery spaces below the protective deck. The engine rooms are separated by a longitudinal water-tight bulkhead. Throughout the boiler spaces longitudinal water-tight bulkheads extend at the sides and form coal bunkers. Above the protective deck a double line of coal bunkers are built, and extend the entire length of the machinery spaces. The officers and crew are accommodated on the protective and upper decks, and under the poop are placed the cabin of the captain, principal officers, and ward room, the cabins of the remaining officers being on the protective deck aft. Accommodations for the crew is on the protective deck before the machinery spaces and under the forecastle deck. The total complement of officers and men is 224. The conning tower is placed on the forecastle deck, and immediately above is built the navigating bridge and search-light platform.

The armament consists of eight 4-inch quick-firing guns, eight 3-pounder quick-firing guns, three 0.45-inch Maxim guns, and two 14-inch torpedo tubes. Two of the 4-inch guns are placed on the forecastle deck, one on the port side, and one on the starboard side; two on the poop deck, one on each side, and four on the upper deck between the poop and the forecastle, two on each broadside.

Two of the 3-pounders are placed forward on the upper deck, one on each side of the bow; two are placed aft on the upper deck, one on each side of the stern, and four on the upper deck between the poop and forecastle, two on each broadside.

Two of the .45-inch Maxim guns are placed on the hammock berthing amidships and one on the forecastle deck. The torpedo tubes are on the upper deck, one on each broadside.

A complete installation of electric lighting will be fitted, including

350 incandescent lamps, 2 search lights of 25,000 candlepower, and 2 yardarm reflectors. The dynamos and engines are placed under the protective deck in the engine room.

The propelling machinery consists of two sets of vertical triple-expansion engines capable of developing an indicated horsepower of 7,000 at a working pressure of 250 pounds per square inch. The cylinders are 20½ inches, 33 inches, and 54 inches in diameter, and length of stroke 27 inches. Steam is supplied by eight of Reed's patent water-tube boilers, with a working pressure of 300 pounds per square inch, which is reduced to 250 pounds at the main engines. All the auxiliary machinery is placed below the protective deck in the machinery spaces, including steering engines, electric-light engines and dynamos, air-compressing engines, air and circulating pumps, feed pumps, fire and bilge pumps, evaporating and distilling machinery, etc. Two powerful fans, 5 feet 6 inches in diameter, are fitted to each stokehold for the supply of air. The pumping, draining, and ventilation are most complete, and in accordance with the latest approved system. All water-tight doors are worked from the upper deck.

STEAM TRIALS.

MARS, 14,900-TON BATTLESHIP, MAJESTIC CLASS.

(Page 9, No. XI; 146, No. XII; 14, No. XIII; 36, No. XIV; 51, No. XV.)

The *Mars*, battleship, built and engined by Messrs. Laird Bros., of Birkenhead, had a thirty hours' coal consumption trial in the English Channel on March 16, 1897. The trial took place between St. Catherine's and the Start. The wind blew half a gale, but the ship was perfectly steady. The draught of water was 24 feet 2 inches forward and 26 feet aft; the steam in boilers, 139.4 pounds, the vacuum being 26.4 inches starboard and 26.3 inches port, with 83.74 revolutions starboard and 83.44 port. The engines worked up to 6,028 H. P., giving the vessel a speed of 14.4 knots by patent log. The coal consumption was 1.94 pounds per I. H. P. per hour.

On the 19th of March the *Mars* completed her steaming trials. The eight hours' natural-draft trial was carried out in the English Channel between St. Catherine's and Beachy Head on the 18th of March. On the run to the eastward the wind was on the quarter, and on the run to the westward it was ahead and abeam, and although it somewhat affected the speed of the ship there was only slight pitching or rolling. The draught of water forward was 24 feet and aft 26 feet. The steam in boilers was 149.8 pounds, while the vacuum was 26.2 inches starboard and 26.6 inches port. The revolutions per minute were 97.57 starboard and 98.4 port, and the collective I. H. P. was 10,159, which was produced with a mean air pressure of 0.21 inch, giving the ship a speed by patent log of 15.96 knots. On March 19 the four hours' forced-draft trial was carried out with equal success, the vessel shaping a westerly course at the start, which gave her a head wind, and therefore she had a fair wind for the conclusion of the trial. The draught of water was 24 feet forward and 26 feet aft, and the steam in boilers 146.5 pounds, while the vacuum was 26.5 inches starboard and 26.7 inches port. There was a mean air pressure of 0.78 inch, and a collective H. P. of 12,434 was realized, with 103.9 revolutions starboard and 104.5 port. The speed, as recorded by patent log, was 17.7 knots.

JUPITER, 14,900-TON BATTLESHIP, MAJESTIC CLASS.

(Page 9, No. XI; 146, No. XII; 14, No. XIII; 36, No. XIV; 51, No. XV.)

The battleship *Jupiter*, built by the Clydebank Engineering and Shipbuilding Company, completed her official trials at Chatham on March 5. On the 2d the vessel went out for her four hours' full-power forced-draft trial, during which time a steam pressure of 150 pounds was easily maintained with an air pressure of 0.62 inch of water. The vacuum in condensers was 26.6 inches. The port engine ran at 101.7 revolutions per minute, and developed 6,127 I. H. P. The starboard engine, running at 102.4 revolutions per minute, developed 6,348 I. H. P.; the collective I. H. P. being 12,475, which gave a mean speed for the four hours of 18.4 knots. The designed power was 12,000 I. H. P., and the speed 17.5 knots.

On the following day the eight hours' natural-draft trial was commenced, and this trial was also satisfactory, as with 0.2 inch air pressure a mean steam pressure of 148 pounds was kept up, and the engines developed a collective I. H. P. of 10,248. The starboard engine, with 93.9 revolutions, developed 5,047 I. H. P., and the port engine, with 94.6 revolutions, developed 5,201 I. H. P. The mean speed on the trial was 15.8 knots; but record was only taken by log, which is often far from reliable.

On the next day the vessel started the thirty hours' coal consumption. On this trial, with a mean collective I. H. P. of 6,193, the coal consumed per I. H. P. per hour amounted to 1.51 pounds. The mean steam pressure during this trial was 146 pounds, the vacuum 26.6 inches. The starboard engine, running at 81.5 revolutions, developed 3,116 I. H. P., and the port engine, running at 81.1 revolutions, developed 3,077 I. H. P.

TERRIBLE 14,200-TON CRUISER.

(Page 15, No. XIII; 39, No. XIV.)

The conditions of trial of the *Terrible* were a run of thirty consecutive hours of continuous steaming at 5,000 I. H. P., a similar run at 18,000 I. H. P., and a final run of eight hours, four of them being at 22,000 I. H. P., and the remaining four at 25,000 I. H. P.

The first of these trials, viz, the stipulated one at 5,000 H. P., was successfully completed on the evening of August 6, the mean power actually realized being 5,110; this being generated by 14 of the 48 Belleville boilers in the ship, the steam pressure varying from 200 pounds to 220 pounds per square inch. On this trial, which commenced at 11 a. m. on the 5th of August, four runs were made over the measured mile in

Stokes Bay. The power developed by the engines, which were run at 64½ revolutions a minute, gave the ship a mean speed of 13.4 knots per hour.

On the morning of August 7 the *Terrible* left Spithead for the thirty hours' trial at 18,000 H. P. Getting under way at 6 a. m., by 9 o'clock the engines were making 98 revolutions a minute, and indicating 19,000 H. P.; but it was found that the slide valve of the starboard intermediate cylinder required adjustment, and as this could not be done at sea the ship was run into Plymouth Sound to carry out the necessary alteration at anchor. On a closer inspection, however, it was found that the defects developed could not be satisfactorily corrected, and that it would be necessary for the *Terrible* to return to Portsmouth.

The ship accordingly left Plymouth Sound on the morning of August 11, 20 out of her 48 boilers only being used. With the engines making about 50 revolutions a minute, and the vessel a speed of 12 knots, the ship reached Portsmouth on the following morning, no further defects being developed on the passage. While the necessary repairs to the engines were being carried out, it was decided by the Admiralty to make an addition of 10 feet to the length of the vessel's funnels; and as a greater heat than was anticipated had been experienced in the uptakes of the boilers it was decided at the same time to lag them with silicate cotton, this being carried up to the level of the upper deck. The necessary alterations to the intermediate slide valves of the main engines and the lengthening of the boiler funnels having been satisfactorily effected, the *Terrible* again left Spithead to undergo the 18,000 H. P. thirty hours' trial, it having been decided by the Admiralty to forego the repetition of the 5,000 H. P. trial successfully completed on August 6.

At starting on this trial the water draught of the vessel was 26 feet 1 inch forward and 28 feet 10 inches aft, the steam pressure in the boilers being 223½ pounds per square inch. Three runs were made on the measured distance between Dodman Point and Rame Head, the mean revolutions of the engines being 102.7 per minute, and the horse-power developed 18,493 indicated. The speed realized by this power was practically 21 knots per hour. Fine weather was experienced during the first part of the run down channel, but later on, when off Portland, there was a sudden fall in the barometer, with heavy squalls, which prevailed throughout the night. This, however, had but little effect on the ship, as she maintained her speed and horse-power until some distance from Scilly, when she was put about so as to get on the measured course on the Cornish coast by daylight. During the whole of the run the engines worked admirably and no difficulty was experienced in maintaining an ample supply of steam from the boilers.

The 18,000 H. P. trial of the ship and engines having been a complete success, the remainder of the day was utilized in sweeping the boiler tubes and getting the engines, etc., ready for the full-power trials on the following day. Accordingly, shortly after 8 a. m. the next morning, the *Terrible* left Plymouth Sound, and in doing so showed the great facility with which so large a ship could be manœuvred through a narrow waterway when fitted with twin screws, these being, as in the case of the *Powerful* and in accordance with recent Admiralty experiments, made to revolve inward.

A short time after getting under way full power was attained, and in the first four hours of the trial three runs were made over the measured course of 23 knots, during which, with a pressure of 229.6 pounds per square inch of steam in the boilers and a mean vacuum in condensers of 26 inches, the engines making a mean of 112 revolutions a minute, the I. H. P. realized was 12,515 in the starboard and 13,057 in the port engines, or a total of 25,572, the mean speed of ship being 22.4 knots an hour.

Rame Head, the eastern limit of the measured course, being reached, the remaining four hours of the run, at 22,000 H. P., was commenced, the course being laid direct for Spithead. With the ship drawing the same water as on the previous four hours, and with a steam pressure of 225 pounds in the boilers, the indicated power developed by the engines, which were running at a mean of 108.8 revolutions a minute, was 10,962 in the starboard and 11,320 in the port, or a total of 22,282.

The coal consumption in the 5,000 H. P. trial of the *Terrible*, which was made before the funnels were lengthened and boilers lagged, was 2.27 pounds per indicated horse-power per hour. This was with sixteen boilers only lighted. On the 18,000 H. P. trial, with all boilers in use, the consumption dropped to 1.7 pounds. No record, however, was taken on the full-power trials, but the experience gained in the stokeholds showed that with a steam pressure of 229.6 pounds and 112 revolutions of the engines a mean speed of ship of 22.4 knots was attained, the power developed being 25,572.

In the *Powerful*, on the same trials, the speed of ship was 21.8 knots, with 114 revolutions of the engines and 25,886 H. P. From the foregoing details it will be seen that the speed attained by both ships has proved to be beyond the expectation of Sir W. H. White, their designer, as on their first trials the *Terrible* realized 13.3 knots with 64.5 revolutions, and the *Powerful* 14.34 knots with 68.3 revolutions.

On the 18,000 H. P. trials identical speeds, over the measured distance, were attained by both ships, the *Powerful*, however, taking 18,677 H. P. to give the same result that the *Terrible* attained with 177 H. P. less. The most trustworthy test at this power was made by the *Terrible* in a straight run from St. Catherines to the Lizard, when a speed was maintained of 21.03 knots.

There is a difference in the design of the propellers of the two ships, but there is the further difference that, whereas the propellers of the *Powerful* are made of Admiralty gun metal, Messrs. Thomson have, in the *Terrible*, used Parson's manganese bronze, whereby it became possible to reduce the thickness of the blades considerably and give their surfaces a fine polish, thus much diminishing the loss due to propeller resistance proper.

ISIS, 5,600-TON CRUISER, TALBOT TYPE.

The *Isis*, a second-class cruiser of 350 feet length, 21 feet beam, and 5,600 tons at 20 feet 6 inches draught, completed her official trials in February, 1897, in the North Sea. She was, like the *Dido*, built by the London and Glasgow Shipbuilding and Engineering Company, Limited, who have received the order to build another ship of the same type, but with Belleville boilers to work at 300 pounds, as compared with 155 pounds in the case of the *Isis*. The result is a change in the proportions of the cylinders. The *Isis* has three cylinders, 33 inches, 49 inches, and 74 inches in diameter, respectively. The new ship, named the *Hyacinth*, has engines with four cylinders—one 26 inches, one 42 inches, and two 48 inches in diameter—the piston stroke in the *Isis* being 39 inches, and in the new ship 30 inches, the latter to insure that the engines will be under the protective deck. The new ship's engines, with natural draft, will develop 10,000 I. H. P., which is in excess of full power of the old ships and is greater by nearly 2,000 I. H. P. than the natural-draft result of the *Isis*. The weight of boilers is less, being in the new ships 470 tons and in the *Isis* and her sister ship 549 tons, while all the machinery weighs in the new ships 870 tons and in the *Isis* and *Dido* 900 tons. But to turn again to the results of the trials: The full power works out to 18 I. H. P. per ton of boilers and 10.94 I. H. P. per ton ot machinery. With 1½ inches of forced draft the power was to be 9,600 I. H. P. The actual pressure was only 1 inch, and the power 9,840 I. H. P. This full-power trial was run on February 20, 1897. The mean steam pressure was 148 pounds, and the vacuum on the starboard engine 27.9 inches and on the port engine 27.9 inches. The total power indicated varied between 10,160 and 9,700. The half-hourly readings from the starboard engine showed a maximum of 4,958 I. H. P. for 143.4 revolutions, and a minimum of 4,874 I. H. P. for 142.7 revolutions. The highest power in the case of the port engine was 5,168 and 145 revolutions, and the lowest 4,730 I. H. P. for 143 revolutions. The mean power for starboard engine was 4,914 I. H. P. and for port 4,926 I. H. P., the revolutions being, respectively, 144 and 146 per minute. It may be added that of the mean power in the case of the starboard engine the high-pressure cylinder contributed 1,635, the intermediate 1,664, and the low-pressure 1,615, while with the port engine the powers were 1,614, 1,615, and 1,697, respectively.

There was, unfortunately, no method of determining the speed of the ship on a set course; but the mean result of two patent logs was 21.2 knots; and here it may be noted that the *Dido*, for a mean of 145.2 revolutions and 9,863 I. H. P., got 21.1 knots. The *Isis* was at a mean draught of 20 feet 6 inches and the weather was fine, the wind being of force 4. The natural draft trial was on February 19. The weather was fine, but hazy. During the eight hours the total power indicated varied between 8,214 and 8,291 I. H. P. The variations in the port engine were between 4,057 and 4,153 I. H. P., the revolutions being from 135.8 to 137. In the case of the starboard engine the maximum power was 4,206 for 136 revolutions and the minimum power 4,060 I. H. P. for 135 revolutions. The speed was 19.8 knots. The boilers worked all right, and at no time did the air pressure in the stokehold exceed 0.48 inch, while the mean was 0.41 inch. The mean steam pressure at the boilers was 149 pounds per square inch, while the vacuum in the case of the starboard engine was 27.7 inches, and in the port engine 28.5 inches. The mean revolutions of the starboard engine were 135 and the power 4,121 I. H. P., and of the port engine 137 revolutions and 4,087 I. H. P., giving together 8,208 I. H. P., while the contract required 8,000 I. H. P. It is interesting to recall that the sister ship *Dido* developed on the corresponding trial 8,339 I. H. P. for a mean of 136.7 revolutions, the starboard engine giving 4,111 and the port engine 4,228 I. H. P., while the highest power recorded was 8,500 H. P. The thirty hours' consumption trial was run on February 22 and 23. The results were as follows: Draught of water forward, 19 feet 4 inches; aft, 21 feet 3 inches; speed of ship, 17.5 knots; steam pressure in boilers, 145 pounds per square inch; vacuum in condensers, 26.8 starboard, 26.5 port; revolutions per minute, 116.5 starboard, 119.2 port; mean I. H. P., 2,441 starboard, 2,484 port; total, 4,925; consumption of coal per I. H. P. per hour, 1.60 pounds; total, 236,548 pounds. Throughout the trials the machinery gave every satisfaction.

GUN TRIALS.

TERRIBLE, 14,200-TON CRUISER.

(Page 15, No. XIII; 39, No. XIV.)

The *Terrible*, cruiser, Capt. W. H. Fawkes, left Spithead on January 16, 1897, for the east end of the Isle of Wight to carry out her gun trials, under the direction of E. F. Jeffreys, who was accompanied by Lieutenant Murray-Aynsley and Lieutenant Drury-Lowe, of the *Excellent.* The Maxims had been fired on the 14th, when the trials were suspended on account of the fog. On the 16th four rounds were fired from each of the 3-pounders carried in the military tops, after which the same number of rounds was fired from each of the sixteen 12-pounders. Four rounds were fired, at various degrees of elevation, from a 6-inch R. F. G. in the foremost upper-deck casemate, and a similar number from the corresponding gun on the main deck, but only two rounds were fired from each of the remaining ten 6-inch guns. The chief interest, however, lay in trying the mountings of the 9.2-inch guns, one of which is carried forward and the other aft.

These wire guns are of the mark VIII pattern, and are carried on the mark IV pattern, central pivot mounting, which is the latest invention of the kind at Woolwich, and it is the first time that the electric form of motor has been exclusively adopted, though the work may be done by manual labor as an alternative. The motor is controlled by a patent liquid brake, actuated by turning a handwheel. By turning the latter the brake action is entirely taken off or put on, the same handwheel actuating the switch. Thus, when the gun requires many degrees of training, the handwheel is at once set hard over and the mounting commences to train at full speed. As the sights approach the target the handwheel is turned back, slowing down the motion. When, however, the sights are nearly on the target in the first instance, the handwheel is only given a turn sufficient to start the motor at slow speed. The gun is mounted on a barbette and protected by a shield, and both barbette and shield are composed of 6 inches of nickel steel. There are in all four motors, two being employed, either together or singly, for training the gun, another for actuating the shell carrier, and another for hoisting the ammunition. The shield, turntable, and gun weigh 65 tons, and the shell carrier, loaded with 55 rounds, 13 tons. The main advantages claimed for the new process are speed and simplicity, seeing that it takes only ten seconds to bring the ammunition up from a depth of 60 feet and thirty seconds for opening the breech and loading, whereas it takes two men, by manual labor, thirty-two seconds to hoist up the ammunition. It was intended to subject both guns to a severe trial, in order to ascertain the effect of concussion on the ship, provision having been made for firing at extreme elevation, extreme depression, and at various bearings, but only one round could be discharged from the foremost gun, as a snowstorm came on and shut out the horizon.

VESSELS REFITTING.

Galatea.—Six-inch R. F. guns to be substituted for breechloaders.

Leander.—R. F. guns have been substituted for breechloaders.

Ajax.—Has undergone an extensive refit, and has been supplied with an armament of B. L. and R. F. guns.

Arethusa.—R. F. guns substituted for breechloaders.

Dreadnaught.—Extensive refit and new boilers.

Hotspur.—Thoroughly overhauled and repaired. Two 6-inch R. F. guns substituted for the two 6-inch B. L. guns, and to have six new 12-pounder R. F. guns.

Edinburgh.—To have 6-inch R. F. guns in place of the 6-inch B. L. guns.

Forth and Thames.—To have 6-inch R. F. guns in place of 6-inch breechloaders.

Mersey.—Having important alterations made in her internal fittings, and being provided with 6 inch R. F. guns in lieu of breechloaders.

Raleigh.—Refit is to include a new upper deck and the substitution of eight 6-inch R. F. guns for the same number of 7-inch muzzle-loaders, and extensive alterations and repairs in the machinery.

Bellona.—Refit includes new water-tube boilers by Thornycroft.

Salamander.—To have an extensive refit, including new water-tube boilers.

VESSELS STRUCK FROM THE LIST.

Ruby, *Conquestador*, *Vengeance*, *Bacchante*, *Canada*, *Grampus*, *Trincomalee*, *Euryalus;* torpedo boats *Nos.* *2*, *5*, and *13*.

TORPEDO BOATS AUTHORIZED AND BUILDING.

Express, torpedo-boat destroyer of about 350 tons, building at Birkenhead by Laird Bros., to have a speed of 33 knots, with 10,000 I. H. P.

Armament.—One 12-pounder, five 6-pounders and 3-pounders, and two Whitehead torpedo tubes.

The *Express* is one of fifteen building by the same firm, the others being 30-knot destroyers of 300 tons displacement.

300-TON DESTROYERS LAUNCHED.

Panther, *Bittern*, *Angler*, *Seal*, *Leopard*, *Gypsy*, *Flying Fish*, *Ariel*, *Osprey*, *Fawn*, *Violet*, *Flirt*, *Zebra*, *Wolf*, *Fairy*.

STEAM TRIALS.

The following torpedo-boat destroyers of 300 tons have had steam trials, with results as follows, being the mean of six runs over the measured mile: *Thrasher*, 30.34 knots; *Fame*, 30.155 knots; *Bat*, 30.7 knots; *Whiting*, 30.42 knots; *Star*, 31 knots; *Griffon*, 30.03 knots; *Foam*, 30.1 knots; *Earnest*, 30.19 knots; *Chamois*, 30.33 knots; *Crane*, 30.56 knots.

GREECE.

VESSELS REFITTED.

PSARA, 4,885-TON BATTLESHIP.

The *Psara* has been refitted at La Seyne, Toulon, and undergone important alterations of masts and battery.

Armament.—Three 10.6-inch B. L. guns, original; five 5.9-inch R. F. guns of 36 calibers, mounted in the central redoubt, one on upper and four on lower deck; one 3.94-inch R. F. gun on the bow; eight 65-millimeter; four 87-millimeter of old armament, which are intended to be removed and replaced by four of 47-millimeter; twelve 37-millimeter revolving guns mounted on the superstructure and newly installed mast platforms.

The foremast was cut off and now forms a short military mast, with a single top, in which are mounted two 37-millimeter and two 47-millimeter guns. The mainmast was lowered about 6 feet with its top, which still mounts four 37-millimeter guns. The mizzenmast has also been cut down, and another military top or platform added. The upper top has two 37-millimeter guns and one projector; the lower top has two 47-millimeter and two 37-millimeter guns.

The sister ships *Spetzái* and *Hydra* were to undergo similar alterations, but were recalled on the outbreak of the war.

ITALY.

NAVAL BUDGET.

The vote for new construction for 1897–98 has been reduced to $3,890,000.

VESSELS LAUNCHED.

AMMIRAGLIO DI ST. BON, 9,800-TON BATTLESHIP.

This vessel was launched at Venice on April 29, 1897. She was over five years on the stocks.

Dimensions.—Length, 344 feet 6 inches; beam, 69 feet 4 inches; draught, 24 feet 9 inches; displacement, 9,800 tons.

Protection.—Complete nickel-steel belt, varying in thickness from 9.8 inches to 3.9 inches.

The barbettes are 9.8 inches thick, while the redoubt and conning tower are 6 inches thick.

Armament.—Four 10-inch B. L. guns, two in each barbette; eight 6-inch R. F. guns in the redoubt; eight 4.7-inch R. F. guns; four 6-pounders, and about twenty machine guns. Five torpedo tubes are fitted.

There are two sets of triple-expansion engines and twelve cylindrical boilers, designed for 9,000 I. H. P., natural draft, giving an estimated speed of 16 knots, which is expected under forced draft to rise to 13,500 I. H. P., 18 knots.

STEAM TRIALS.

CALABRIA, 2,442-TON CRUISER.

This vessel had a full-speed steam trial, making 14.5 knots under natural draft, and 16.4 knots under forced draft, with 4,094 I. H. P.

JAPAN.

PROGRAM OF CONSTRUCTION.

(Page 69, No. XV.)

It is reported that the present cabinet has increased the number of first-class cruisers in the building program from four to six, and the tonnage to 9,200 instead of 7,500 each, with better protection. Two of these powerful cruisers are to be built during the first period of expansion and four during the second.

With regard to the construction of the new vessels, it is reported that the Japanese intend to build one of the first-class cruisers at home, and to procure from abroad four battleships, five first-class cruisers, three second-class cruisers, a torpedo depot ship, and a number of torpedo-boat destroyers and torpedo boats. Already orders have been given for two battleships, in addition to the *Fuji* and *Yashima*, one on the Thames and one on the Clyde. One first-class cruiser has been ordered in France and one in Germany, two second class cruisers in United States, and one in England from Armstrong & Co.

VESSELS BUILDING, ORDERED, OR PROPOSED.

BATTLESHIP.

It is reported that a battleship similar to the *Jupiter*, 14,900 tons, has been ordered by the Japanese Government to be built on the Clyde.

SHIKISHIMA, 14,850-TON BATTLESHIP.

(Page 36, No. XVI, Part II.)

The battleship building by the Thames Ironworks and Shipbuilding Company has received the name of *Shikishima*.

Dimensions: Length between perpendiculars, 400 feet; length over all, 438 feet; beam, 75 feet 6 inches; draught of water, 27 feet 3 inches; displacement, 14,850 tons; coal capacity, 700 tons.

Protection.—There will be a continuous belt of armor from stem to stern.

Over the central part of the ship this belt will be 9 inches thick and 8 feet 2 inches deep, but it decreases at the ends of the vessel from 7 inches in thickness to 4 inches. Above this lower belt amidships—that is, between the barbettes—is another belt of 6-inch armor, which extends as high as the main deck. The length of this belt is 250 feet. At the ends of the space there are curved transverse bulkheads of 14-inch armor. These bulkheads extend from the protective to the main deck. In this way a complete citadel 250 feet long is formed. The barbettes, as will be seen, are arranged somewhat differently to the plan generally adopted, they being contained within the curved bulkheads. They are protected by 14-inch armor with 4-inch teak backing, and rise to a height of 4 feet above the upper deck. Between the main and upper decks screen bulkheads are also worked, and extend from the barbettes to the ship's side. There is a continuous armored deck extending from stem to stern. It is 3 inches thick in the flat part and 5 inches thick on the slopes, but tapers toward the ends. It rises from the lower edge of the armored belt to a height of 3 feet above the water line. The construction is on the usual double-bottom system, the double bottom connecting with water-tight flats at the ends of the vessel, thus carrying the double bottom practically to the ends of the ship.

The main armament consists of four 12-inch 40-caliber guns, two being in each barbette. There are eight 6-inch quick-firing guns on the main deck and six more on the upper deck. These are all above the side armor, and are therefore placed in separate casemates having

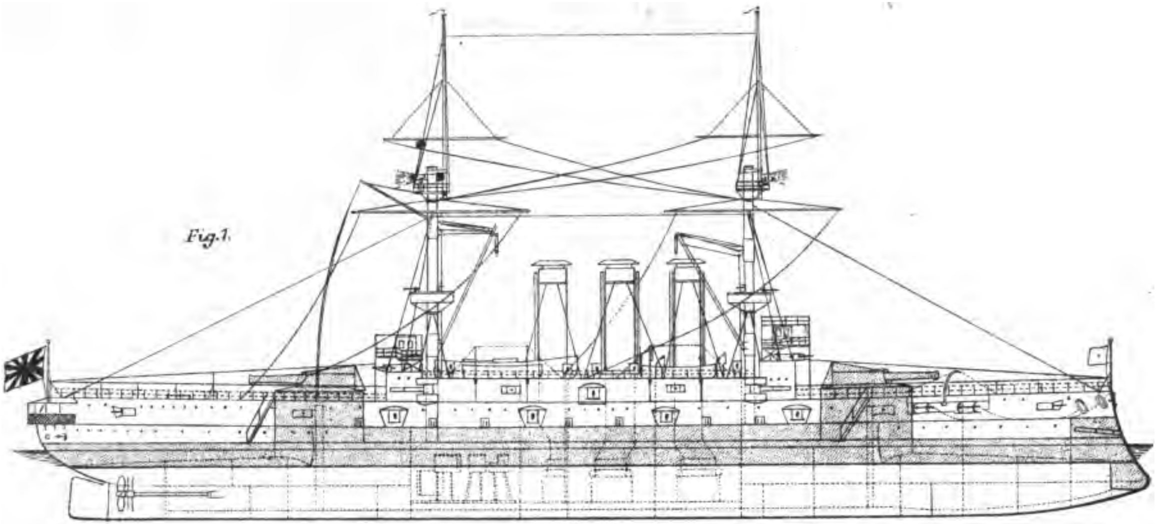


Fig. 1.

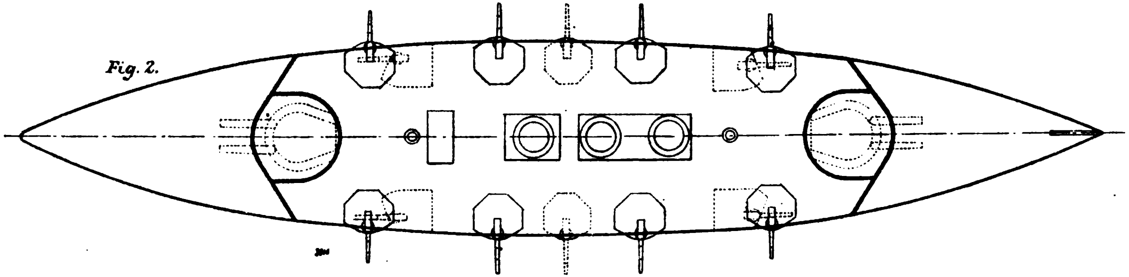


Fig. 2.

JAPANESE BATTLESHIP SHIKISHIMA, 14,850 TONS.

6-inch armor. These casemates can be made into water-tight chambers. There are also twenty 12-pounder quick-firing guns on the upper deck and eight 47-millimeter quick-firing guns on the upper and main decks and in the military tops. There are also four 47-millimeter quick-firing guns on the bridges and upper works. There are five 18-inch torpedo discharges, one, which is protected by armor, being in the stern.

The steering of the vessel will be effected by steering gear on Cameron's self-regulating principle, worked by steam steering engines, in duplicate, as a preventive in case of the possible failure of one set, the controlling gear being on Messrs. Brown's telemotor principle, controlling the helm from pilot house, forward bridge, after pilot house and bridge, and from the protective deck forward.

The propelling machinery of the new ship, which will be of 14,500 I. H. P., will be supplied and fitted by Messrs. Humphrys, Tennant & Co., of Deptford, and will consist of two complete sets, in separate engine rooms, of three-cylinder triple-expansion twin-screw engines, the diameters of the cylinders being 34 inches, 53 inches, and 84 inches for high, intermediate, and low pressure, respectively, with a piston stroke of 48 inches. They will be supplied with steam by 25 of the latest type of Belleville boilers, having an aggregate heating surface of 40,000 square feet.

The ship will be lighted throughout by electricity, the installation consisting of four sets of combined engines and dynamos, three of 400 ampères and 80 volts each and one of 200 ampères and 80 volts, the latter of the direct-current type. Nine hundred incandescent lamps of 16 candlepower each will be provided for lighting saloons and cabins, store, engine, and boiler rooms, magazines and coal bunkers, etc. Six search lights, each of 20,000 candlepower, having mirrors 24 inches in diameter, will also be provided.

The complement of boats carried by the new battleships will be fourteen, and will include two 50-foot vedette boats, fitted with the Thames Ironworks water-tube boilers; one 42-foot launch, and one 30-foot steam pinnace, each of which will carry Whitehead torpedoes and be fitted for mining and countermining.

The new ship will have a complement of men and officers to the number of 741, which will include an admiral and thirty-eight officers. The contract time for the completion of the vessel has been fixed at twenty-seven months.

VESSELS LAUNCHED.

TAKASAGO, 4,160-TON CRUISER.

On May 11, 1897, there was launched from the Walker Shipyard of Messrs. Sir W. G. Armstrong, Whitworth & Co. the cruiser *Takasago*, which is being built to the order of the Japanese Government. The *Takasago* is the same type of vessel as the *Yoshino*. Her length is

360 feet; breadth, 46 feet 6 inches; mean draught, 17 feet; displacement, 4,160 tons. Her armament will consist of two 8-inch R. F. guns, ten 4.7-inch R. F. guns, twelve 12-pounder R. F. guns, six 2½-pounder R. F. guns, and five torpedo tubes. The *Takasago* has a protective deck extending over the whole length of the ship, 1.75 to 4.5 inches in thickness, and the conning tower is of steel, and is 3 inches thick.

STEAM TRIALS.

FUJI, 12,450-TON BATTLESHIP.

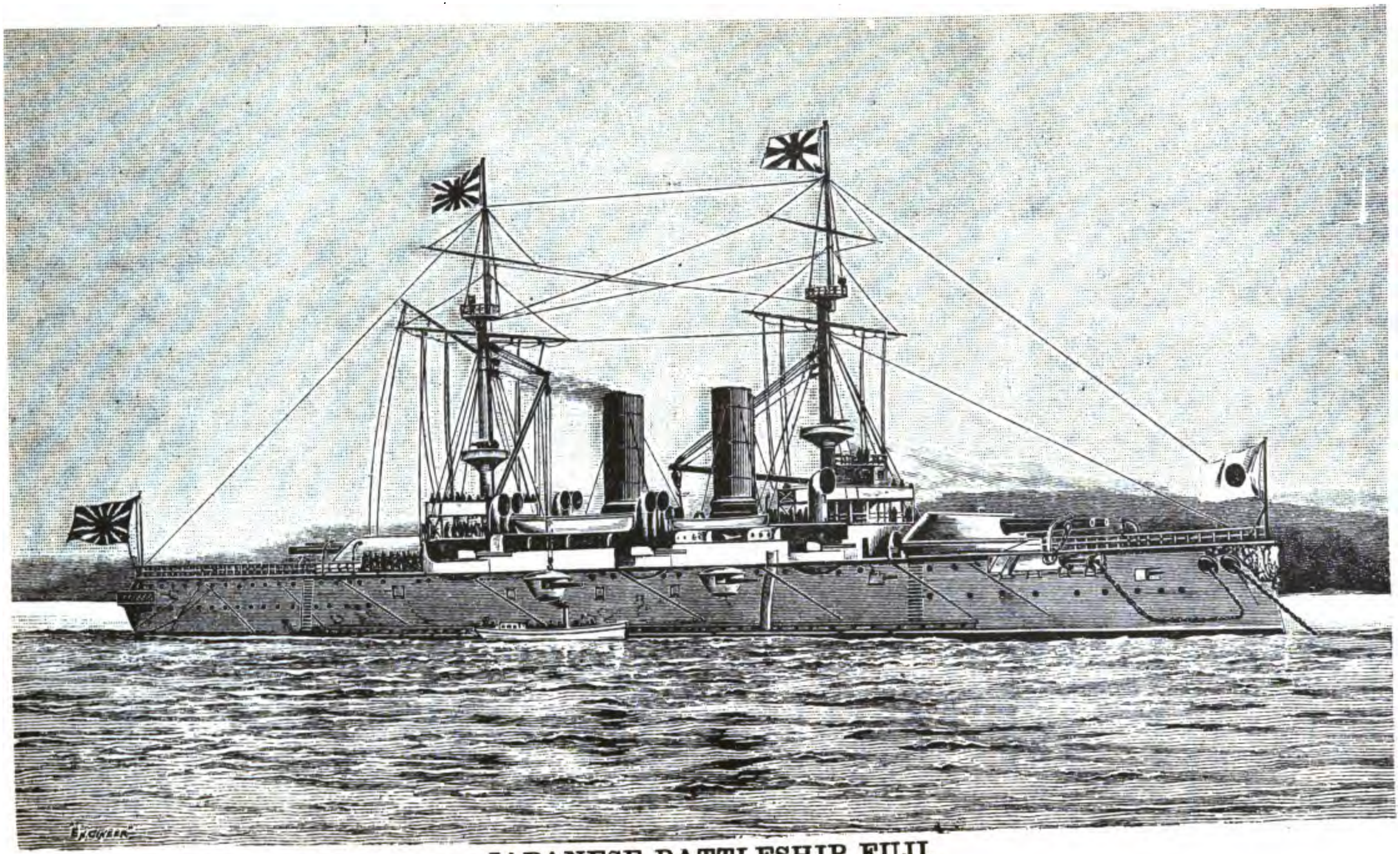
(Page 71, No. XV.)

The Japanese battleship *Fuji*, built at the Thames Ironworks, and engined by Messrs. Humphreys, Tennant & Co., went out for her official trials in March. The first day's trial, for six hours' steaming, made off the Thames on March 18 over a 10-knot course with open stokeholds, gave a mean speed of 16.937 knots with 10,200 I. H. P. The second day's trial, for full speed, gave a mean speed of 18.655 knots with 14,100 I. H. P., the vessel being down to her deep-load draught. The steering gear was supplied by Messrs. Davis & Co., and put the helm from hard over to hard over in sixteen seconds.

The principal dimensions of this fine ship, which is an improvement upon the *Admiral* class of the British navy, she having an additional deck forward and aft of the citadel, giving 8 feet more height of freeboard and providing excellent quarters for officers and crew well above water, are as follows: Length between perpendiculars, 374 feet; length over all, 406 feet 6 inches; molded breadth, 73 feet; depth to top of keel plate, 44 feet 9 inches; mean water draught, 26 feet 3 inches, and displacement, 12,450 tons.

She was designed by Mr. G. C. Mackrow, naval architecct to the Thames Ironworks Company, and her keel plate laid on September 1, 1894. The time for her completion was originally to have been five years from the date of signing the contract for construction, but the war with China having broken out, this was subsequently shortened to thirty-three months.

The *Fuji* is constructed on the bracketed frame system, with wing passages on each of her sides for coal stowage if required. She has a cellular double bottom, and is of steel throughout, her ram, stem, stern, and rudder posts, with propeller-shaft brackets, being malleable steel castings. Bilge keels to counteract any rolling tendency, about 2 feet 6 inches wide, are fitted on both her sides for about half her length. The side armor consists of two belts of Harveyed steel armor plate extending for 226 feet of her length amidships, the lower belt being 8 feet wide—5 feet below and 3 feet above the load water line—18 inches thick at the middle and 14 inches at the ends, and the upper belt—for the protection of the citadel or gun battery—7 feet wide and 4 inches thick, both belts being backed with teak, to which they are substantially bolted, bringing up the thickness of the ship's sides at these parts to 22 inches.



JAPANESE BATTLESHIP FUJI.

The *Fuji* has four principle decks, viz, main, protective, upper, and lower decks. The protective deck, which is of steel 2½ inches thick in the middle, is at the level of the top of the lower armor belt, and is flat athwartships for the length of that belt; at its ends it is continued at a lower level both forward and aft, terminating at the bow in a powerful ram. The battery or citadel, whose length equals that of the main armor belt, and whose sides protect the whole of the machinery space, has built at both of its ends a barbette of the usual pear-shaped form in plan, armored with Harveyed steel plate, which is 14 inches thick between the main and upper deck and 9 inches thick down to the protective deck, on which it stands. To protect the guns in the battery from a raking fire, screens of 6-inch steel armor run across the ship at both its ends on the main and lower decks. Over the rear end of the forward barbette there is an armored conning tower plated with 14-inch Harveyed steel, and in a similar position on the aft barbette a director tower, having 3-inch armor of the same material.

The armament of the *Fuji*, the whole of which has been supplied by Messrs. Sir W. Armstrong & Co., of Elswick, consists of two 12-inch breech-loading 49-ton wire guns, 40 calibers in length, in each barbette; six 6-inch quick-firing guns, three on each side, also 40 calibers long, on the upper deck, protected by heavy steel shields; four 6-inch similar guns, two on each side, in casemates, protected with 6-inch nickel steel armor on the main deck; twenty 3-pounder Hotchkiss quick-firing guns distributed on main deck, bulwarks, and bridges; and four similar 2½-pounder guns placed in the tops. The 12-inch or barbette guns, the height of whose muzzles above the load-water line is 25 feet, have an arc of fire of 240 degrees; the two forward and two aft 6-inch guns of 90 degrees before and 60 degrees abaft the beam, and the two 6-inch guns amidships an arc of 120 degrees, or 60 degrees before and 60 degrees abaft the beam. The casemates for the 6-inch guns in the battery are made water-tight, with hinged doors, and have 6-inch nickel armor on their fronts and 2-inch steel plating at their backs, giving great protection to the gun crew from splinters or other débris.

In addition to the gun armament there are five 18-inch torpedo tubes, one above water and four submerged. The ammunition for serving the guns in the barbettes, battery, etc., is stored in magazines and shell rooms located on the platform deck in the lower part of the ship, forward of the boiler rooms and aft of the engine rooms. Vertical armored hoists or shafts lead up from them to the interior of the barbettes at the rear or breech ends of the heavy guns, and connecting these hoists at the level of the lower deck and on either side of the ship are ammunition passages, with separate hoists, for serving with ammunition the 6-inch guns in the battery on the main and upper decks.

The propelling machinery of the *Fuji* consists of two independent sets, in separate engine rooms, of three cylinder triple-expansion screw engines. They are designed to develop 14,000 I. H. P. on trial with moderate forced draft to the boilers, which are of the ordinary cylindrical marine type, ten in number, single-ended, each having four corrugated furnaces, and designed for a working pressure of 155 pounds per square inch. The boilers are placed in four separate water-tight boiler rooms, two on each side of the ship, three being fitted in each forward boiler room and two in each after one. Simplicity of design is the prevailing feature in the propelling engines of the *Fuji*, the whole of the working parts being very accessible and fitted in the same substantial way as those supplied by their makers to the British Admiralty. With the one exception of having a piston stroke of 3 feet 9 inches instead of 4 feet 3 inches, they are identical with the engines fitted by the same firm on board the British first-class battleship *Prince George*.

The diameters of the cylinders are 40 inches, 59 inches, and 88 inches for high, intermediate, and low pressure, respectively, with a piston stroke of 45 inches. The crank shafts, which are in three parts and interchangeable, are of hollow steel, 15¾ inches in diameter in the bearings, with crank pins 16¼ inches diameter and 18 inches long. The tunnel and stern shafting is also of hollow steel, the former being 14¾ inches and the latter 15¾ inches diameter. Each set of engines drives a four-bladed screw propeller 17 feet 6 inches diameter and 19 feet pitch. The engine cylinders are each supported by two forged-steel columns on the front or starting side of the engines, and at the back by cast-steel frames of box form, which carry the piston-rod guide bars. Each engine has one air pump 18 inches diameter, driven off the low-pressure cylinder crosshead. There are two main condensers, with a total cooling surface of 13,500 square feet, the circulating water for which is supplied by four centrifugal pumps having impellers 3 feet 10 inches diameter, each capable of delivering 1,200 tons of water per hour, and so arranged as to clear the ship of water in case of flooding or other emergency. Between the two main engine rooms of the ship, which have each a separate fore-and-aft water-tight bulkhead amidships, there is a space about 9 feet in width, which is utilized for engineers' workshops and storerooms. The coal-bunker capacity provided in the ship is equal to 1,200 tons, but at her normal load draught 700 tons only are carried. The coal protection in the side bunkers, which extend the whole length of the machinery space, averages about 10 feet in thickness.

Accommodation for the executive officers of the *Fuji*, which is intended for a flagship, is provided on the main deck, the admiral's quarters being at the extreme after end, his saloon, which is a capacious apartment—30 feet athwartships by 15 feet fore and aft—looking out onto the stern gallery or walk. Forward of this saloon are the ward and dining rooms, the latter being 25 feet fore and aft and 34 feet broad; and still farther forward, on either side of the ship, are the officers' cabins. In connection with the fitting of these apartments, and in consequence of the disastrous effects of shell fire from machine guns, as evidenced in the late war with China, all woodwork is substituted wherever possible by steel or other metal. The bulkheads dividing the officers' cabins are of corrugated galvanized sheet steel, the paneling being japanned in colors, which was done by native artists. The crew are berthed in the fore part of the ship, there being mess accommodation for the entire ship's company—about 600 men—at one sitting.

The *Fuji* has two military masts, with two tops to each, the lower ones being for fighting purposes and the upper ones for search lights and signaling. She has also two funnels. The masts are fitted with steel derricks for lifting in and out the heavy boats. Thirteen boats in all will be carried, and will include two 56-foot torpedo vedette boats of British admiralty type, a 42-foot steam launch, a 30-foot steam pinnace, two 30-foot cutters, a 28-foot life cutter, a 30-foot and a 27-foot gig, with a 27-foot lifeboat, a dingey, and a balsa life raft. The vedette boats are fitted to carry two fish torpedoes in dropping gear and a 2½-pounder Hotchkiss gun in the bow. The 42-foot launch, the 32-foot pinnace, and each of the 30-foot cutters also carry a 2½-pounder Hotchkiss gun in the bow.

TORPEDO BOATS BUILDING, ORDERED, OR PROPOSED.

The Japanese Government has ordered four torpedo-boat destroyers of Yarrow, to have a guaranteed speed of 31 knots.

Two torpedo-boat destroyers were ordered of Thornycroft, having 275 tons displacement and 5,500 I. H. P., with a speed of 30 knots.

Five seagoing torpedo boats have been ordered of Normand & Co., Havre.

Seven torpedo boats are reported to be building for the Japanese Government by Schichau, at Elbing, Prussia.

NETHERLANDS.

VESSELS LAUNCHED.

ZEELAND, 3,839-TON CRUISER.

(Page 51, No. XIV.)

The protected cruiser *Zeeland*, the third of three sister ships, was launched at Flushing on March 20, 1897.

NORWAY.

VESSELS LAUNCHED.

TORDFNSKJOLD AND HARALD HAARFAGRE, 3,437-TON COAST-DEFENSE VESSELS.

(Page 75, No. XV.)

These vessels were launched from the shipyard of Armstrong, Whitworth & Co., the former on March 18, 1897, and the latter on January 4, 1897, and are similar in all respects. These vessels are built of steel.

Dimensions.—Length, 280 feet; beam, 48 feet 6 inches; draught, 16 feet 6 inches; displacement, 3,437 tons.

They have an armor belt 6.5 feet wide, extending over about 170 feet of their length, with a thickness of 7 inches. The belt is terminated by 7-inch transverse bulkheads. They also have a protective deck of 2-inch steel, extending from end to end, below which are the machinery, magazines, and steering gear. The coal bunkers are situated at the sides, part being above the protective deck, these bunkers when full adding materially to the water-line protection of the ships. Space is provided for 400 tons of coal, but 200 tons will be carried on the normal draft.

The armament of these vessels is composed entirely of Elswick R. F. guns, and is as follows: Two 8-inch guns with heavy shields, mounted in 6-inch armored barbettes, one forward and one aft on the upper deck, each with considerable arcs of training; six 4.7-inch R. F. guns, placed on the upper deck broadsides, two firing right ahead, two right astern, and two on the beam; six 12-pounder R. F. guns; six 1.5-pounder R. F. guns, placed in the most advantageous positions; and in addition they carry two submerged torpedo tubes.

The engines are of sufficient power to give a speed of 16 knots with natural draft.

PORTUGAL.

VESSELS BUILDING, ORDERED, OR PROPOSED.

TWO 1,800-TON CRUISERS.

(Page 13, No. XVI, Part I.)

Two protected composite cruisers of 1,800 tons are to be built for the Portuguese Government by the Forges et Chantiers de la Mediterranèe, at Havre.

The following will be the dimensions and characteristics: Length, 246 feet; beam, 35 feet 6 inches; draught, 14 feet 3 inches; armament (Canet R. F.), two 5.9 inch, four 4.7 inch, and eight 1.8 inch, on pivot mounts with shields; two machine guns, and one torpedo tube. The ammunition hoists will be worked by electricity. Protection will be given by transverse water-tight compartments and a 1.5 inch steel deck, surmounted by a double cofferdam rising 3 feet above the water line. Three-cylinder vertical triple-expansion engines of 2,650 H. P., driving two screws, will be supplied by two sets of boilers on the Normand and Sigaudy principle. The natural-draft speed is to be 15 knots. The cruisers will carry main and mizzen topmasts, with square and fore-and-aft sails.

RAINHA d'AMELIA, 1,660-TON CRUISER.

This vessel is to be built at Lisbon, after the designs of the French engineer Croneau.

Dimensions.—Length, 246 feet; beam, 36 feet; draught, 14 feet 8 inches.

Two vertical triple-expansion engines, designed to develop 3,000 I. H. P. with natural draft and 4,500 I. H. P. with forced draft, give speeds, respectively, of 16 knots and 17.5 knots. The radius of action is to be 4,200 miles at a speed of 10 knots.

Armament.—Four 5.9-inch R. F. guns, four 3.94-inch R. F. guns, two 47-millimeter and four machine guns, with two torpedo tubes.

The complement will be 250 men.

4,100-TON CRUISER.

A protected cruiser of 4,100 tons and 14,500 I. H. P. is building at Elswick by Armstrong & Co. The armored deck is 4.5 inches thick on the slopes. The armament is to be four 6-inch and eight 4.7-inch R. F. guns of 45 calibers, twelve 3-pounders, six 1-pounders, and four Maxim guns. There are five torpedo tubes, three being submerged. The engines are by Hawthorne, Leslie & Co., and the boilers of the Yarrow type to give a speed of 22 knots. She is to be finished by May, 1898.

RUSSIA.

NAVAL BUDGET.

The amount voted for new construction for the year 1897-98 is $7,668,277, which is more than $2,000,000 less than the preceding year.

VESSELS BUILDING, ORDERED, OR PROPOSED.

TWO 12,840-TON BATTLESHIPS.

Two first-class battleships of 12,840 tons are to be laid down this year. Of these, one is expected to be ready for launching in 1898 and the other in 1900.

8,880-TON BATTLESHIP.

A new barbette battleship is to be laid down at Nicolaieff. The new vessel is to be similar to the *Rostislav.* Length, 341 feet; beam, 66.5 feet; draught, 24 feet. The engines are to be of 8,500 I. H. P., and the speed 16 knots. She will have two barbettes, each with two 12-inch guns.

4,000-TON COAST-DEFENSE VESSEL.

A coast-defense vessel of 4,000 tons displacement is to be laid down in the summer of 1897.

STEAM TRIALS.

TRI SVIATETELIA, 10,600-TON BATTLESHIP.

(Page 68, No. XIII; 38, No. XVI, Part II.)

This vessel had a twelve hours' successful full-speed trial. She attained a speed of 18 knots. The contract called for only 16 knots.

VESSELS LOST.

GANGUT, 6,590-TON BATTLESHIP.

Reported wrecked in Gulf of Finland. Total loss.

TORPEDO BOATS.

Torpedo boat *No. 134*, *Pernow* type, was launched at the Newsky Mechanical Works.

SPAIN.

VESSELS BUILDING, ORDERED, OR PROPOSED.

ISABEL LA CATÓLICA, 3,000-TON CRUISER.

The Spanish residents of North and South America propose to build a 3,000-ton cruiser for the Spanish navy, to cost about $1,400,000, and to be called *Isabel la Católica.*

RIO DE LA PLATA, 1,775-TON CRUISER.

A cruiser of 1,775 tons displacement is to be built in Havre, France, by subscription of the Spanish colonies of the Rio de la Plata. The protective deck is to be 1⅛ inches thick on the slopes. She is to have a speed of 18 knots with natural draft and 20 knots with forced draft. The armament is to consist of six 3.94-inch R. F. guns, six 2.95-inch R. F. guns, and two 37-millimeter automatic machine guns. The cost will be about $600,000 without armament. The armament is to be made in Spain. The vessel is to be constructed under the supervision of the minister of marine. The vessel is to be called the *Rio de la Plata.*

REINA REGENTE, 5,300-TON CRUISER.

(Page 86, No. XV.)

The keel of this cruiser was laid in March, 1897, at Ferrol, on the building slip from which the *Cardenal Cisneros* was launched. She is to be sheathed and coppered. The boilers are to be of the Belleville type, improved.

ALMONTE AND CORCUERA.

Two small gunboats have recently been built at Cavite, Luzon, to guard Lake Lanao, in the Island of Mindanao, Philippines.

Dimensions.—Length, 96 feet 6 inches; beam, 24 feet 6 inches; mean draught, 3 feet 8 inches; speed, 10 knots; 175 I. H. P.

Armament.—Two small R. F. guns, one at each end of the superstructure, and some smaller guns in broadside.

VESSELS LAUNCHED.

MARQUES DE LA VICTORIA AND DON ALVARO DE BAZAN, 823-TON TORPEDO CRUISERS.

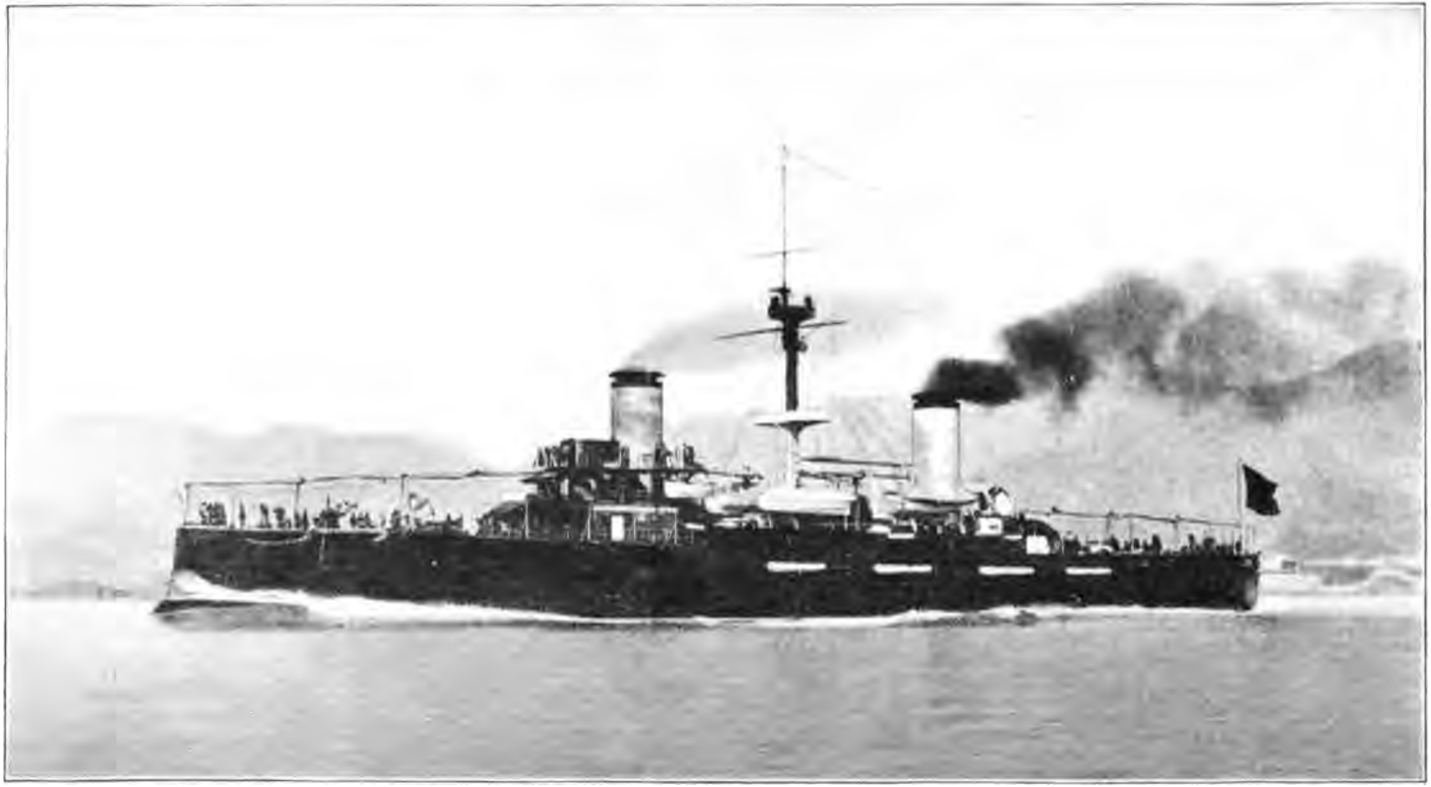
(Page 74, No. XIII; 86, No. XV.)

These two torpedo cruisers were launched in March.

CARDENAL CISNEROS, 7,000-TON CRUISER.

(Page 50, No. X; 85, No. XV.)

This armored cruiser was launched March 19, 1897, at Ferrol. She is similar to the *Princesa de Asturias* and *Cataluña.*



CRISTOBAL COLON.

STEAM TRIALS.

ALFONSO XIII, 4,800-TON CRUISER.

(Page 51, No. XI.)

This cruiser has completed her steam trials and joined the fleet at Port Mahon. It is reported that the speed, with natural draft, was 16 knots.

CARLOS V, 9,089-TON CRUISER.

(Page 50, No. IX; 60, No. XIV.)

This first-class armored cruiser has completed her steam trials. The average speed for six hours was 18.25 knots, with 88 to 90 revolutions, and a boiler pressure of 140 pounds. The 5.5-inch R. F. guns and mounts also had a satisfactory trial with maximum charges. The 11-inch guns and mounts are not yet in place.

CRISTOBAL COLON, 6,840-TON CRUISER.

(Page 65, No. XV.)

This cruiser is a sister ship to the Argentine cruiser *José Garibaldi* (p. 19, No. XVI, Part II), and built by the same firm, Ansaldo, of Genoa. There is a slight difference in the battery, and the *Colon* has 24 Niclausse boilers, while the *Garibaldi* has cylindrical boilers.

Dimensions.—Length between perpendiculars, 328 feet; beam 60.7 feet; draught, 23.3 feet.

Protection.—Complete water-line belt 8.2 feet wide and 5.9 inches thick throughout the length of the citadel, and tapering to 2.75 inches at the ends. The citadel rises above the belt amidships to the level of the main deck and is the full length of the engine and boiler spaces. It protects the 6-inch R. F. guns, ammunition hoists, torpedo tubes, communication tubes, etc. It is from 4.7 inches to 6 inches thick on both ends and sides. The barbette shields are 4.7 inches thick. The protective deck is from 1.18 inches to 1 inch thick, and extends the whole length of the ship. The ceiling of the citadel is 1.96 inches thick. The armor is not face hardened.

Armament.—Two 254-millimeter (10-inch) guns mounted singly in two barbettes, one forward and one aft on main deck, with arc of fire of about 270 degrees; ten 6-inch R. F. guns in broadside in central armored citadel, five each side (two of these can fire ahead and two astern); six 4.7-inch R. F. guns, protected by steel shields, on the main deck (two of these can fire ahead and two astern). The forward 10-inch gun and one of the 6-inch guns are not yet aboard.

The secondary battery is composed of ten 57-millimeter, ten 37-millimeter, and two machine guns, distributed on the decks and in the military tops. There are five under-water torpedo tubes (Schwarzkopf), two in each side in the citadel on the berth deck and one astern.

There are three search lights, two 15.75-inch and one 29.5-inch.

The engines are exactly like those of the *José Garibaldi*. The engines are designed to develop 6,750 I. H. P. each with forced draft, and to give the vessel a speed of 19.5 knots. The auxiliary engines, of a total of 500 I. H. P., comprise six engines for electric lighting and the working of the barbettes, circulating pumps, ventilators, etc.

The boilers are of the Niclausse system, twenty-four in number, in groups of six, with four independent fire rooms. There are two smokestacks. The normal coal supply is 600 tons, but 1,200 tons can be carried if necessary.

First steam trial: Twelve boilers, 4,000 I. H. P. On April 10, 1897, the *Colon* steamed with twelve boilers, and during six hours developed 4,760 I. H. P., making 75 turns and a speed of 15 knots.

Second steam trial: April 13, the other twelve boilers, with same result.

Third steam trial: April 28, with all fires lighted, full power, natural draft; speed obtained during four hours' run, 19.35 knots.

Fourth steam trial: April 30, with all boilers, natural draft, full power; mean speed, 19.6 knots. At times the speed exceeded 20 knots.

This trial was so satisfactory, the speed exceeding by one-tenth of a knot the speed required under forced draft, that the forced-draft trial was omitted. The speed of the *José Garibaldi* under the same conditions was 1.3 knots less, and this gain in the *Colon* is attributed to the boilers alone.

Coal consumption trial: May 4, with all boilers, the mean speed obtained was 18.3 knots, with a coal consumption of 1.62 pounds per I. H. P. per hour for eight hours.

The coal used in these trials was from the French mines of Nœux, made into bricks, which facilitated the measurements.

The firing in all the trials was performed by Italians, who were firing for the first time not alone Niclausse boilers, but water-tube boilers of any kind.

VESSELS REFITTING.

PELAYO, 9,900-TON BATTLESHIP.

(Page 40, No. XVI, Part II.)

The necessary repairs are completed, but has not received new boilers or guns, which are to be placed aboard later.

VITTORIA, 7,250-TON BROADSIDE BATTLESHIP.

(Page 41, No. XVI, Part II.)

Repairs not completed. Received new boilers.

NUMANCIA.

(Page 41, No. XVI, Part II.)

Repairs not completed. Old boilers have been removed.

GENERAL VALDEZ, 1,600-TON STEAMER.

Being prepared for armament, the money for which has been appropriated.

URANIA, 1,000-TON STEAM YACHT.

To be used as a dispatch vessel. Money for armament has been appropriated.

TORPEDO BOATS.

AUDAZ, 400-TON TORPEDO-BOAT DESTROYER.

This destroyer was launched by the Clydebank Engineering and Shipbuilding Company at Clydebank on February 6, 1897. She is similar to the *Furor* and *Terror* (p. 42, No. XVI, Part II), but of greater tonnage and designed to be 2 knots faster. She will carry the same armament. She is reported to have had a satisfactory official trial.

OSADO, 400-TON TORPEDO-BOAT DESTROYER.

This destroyer was launched at Clydebank on March 16, 1897. Has not had official trial. She is in all respects similar to the *Audaz.*

DESTRUCTOR, 450-TON TORPEDO-BOAT DESTROYER.

This destroyer is receiving four new Normand boilers in place of the old cylindrical boilers, at Thomsons', Clydebank.

SWEDEN.

VESSELS LAUNCHED.

EDJERN AND JARNAN, 670-TON TORPEDO CRUISERS.

These two small torpedo cruisers have been launched in Sweden.

Dimensions.—Length, 223 feet 4 inches; beam, 27 feet 3 inches; displacement, 670 tons; two engines, developing 4,000 I. H. P. and a speed of 19 knots.

Armament.—Two 4.7-inch R. F. guns, four 57-millimeter, and one torpedo tube.

IX.

NOTES ON ORDNANCE AND ARMOR.

By Ensign W. D. BROTHERTON, United States Navy,
Staff Intelligence Officer.

GUNS AND MOUNTS

NEW CANET R. F. GUNS FOR THE GREEK NAVY.

The Greek armored vessels *Hydra*, *Spetzia*, and *Psara* were built in 1888–89 by the Societé des Forges et Chantiers. Each ship was armed with three 27-centimeter (10.6-inch) and three 15-centimeter (5.9-inch) guns. At that time R. F. guns of medium caliber had not yet come in.

Two years ago the Greek minister of marine desired to increase the power of resisting torpedo attack by supplementing the existing armament by the addition of R. F. guns of small caliber and flat trajectory. To this end he ordered Canet 10-centimeter and 65-millimeter guns of 50 calibers length. It was decided that each of the three ships should receive one 10-centimeter, firing forward, and eight 65-millimeter guns. M. Levidis, the minister of marine, gave the order at the beginning of 1896 to begin the supplementary armament of the *Psara*, and in September that of the two other ships was also ordered. The guns of the *Psara* have been delivered, and have given excellent results. The following description of these pieces has been received: The 10-centimeter gun discharges a 13-kilo (28.7-pound) projectile, and the 65-millimeter gun one of 4 kilos (8.8 pounds). Fixed ammunition is used.

The following are the principal features in the mountings: The 10-centimeter guns are all of identical pattern, and consist of the following parts (*see* figs. 1 and 3): (1) A gun tube extending for the entire length of the piece, and carrying the screw box; (2) a jacket on the breech end (H H in figure) to which is connected the recoil brake piston; (3) a hoop strengthening the forward part of the gun. The breech gear is of the Canet R. F. system, and is worked by a single motion. It comprises (1) the breech screw with interrupted threads pierced in its center by the firing tube; (2) the bracket which supports the screw while the breech is open; (3) the mechanism for working the breech and for the extraction of the cartridge, providing, by the simple movement of a lever from left to right, the following successive movements—the rotation of the screw, the withdrawal with extraction of cartridge, and the rotation round the vertical axis of the bracket, with final ejection of the cartridge; (4) the firing mechanism, with hand lever worked by the pointer, or "No. 1," and the safety gear.

The mounting for the 10-centimeter gun consists of the following parts: (1) The carriage proper, consisting of a tube A A, inclosing the breech portion of the gun, acting as a cradle, and carrying near its front, trunnions B, on which the whole system revolves for elevation. The recoil cylinders C are fixed, running along beneath the tube, while above it lies a recuperator, with springs independent of the recoil cylinder, which provide for the automatic running up of the gun after discharge; (2) the saddle, formed of two cheek pieces, in which the trunnions rest, a bed connecting the trunnion blocks, and a pivot entering the bed, and, lastly, the sighting gear; (3) the bed and truncated pedestal fixed to the deck. The bed has on its upper extremity a collar, holding the saddle pivot. On this pedestal revolves the whole system. The brake is of the Canet construction, imposing the minimum strain on the various parts of the mounting. The recovery of the gun after recoil is completely automatic, and is effected at all angles of elevation, with the assistance of the springs. A special arrangement provides for putting the guns out of the firing position, either immediately after delivering a round or at any other moment, by means of hydraulic gear. Elevation is performed by the pointer, or "No. 1," by means of the winch or handwheel F, and an endless screw gearing on a toothed sector, seen at J in the engraving of the 65-millimeter gun. Direction is also given by the pointer by means of a handwheel and screw shaft, gearing on a horizontal toothed ring on the bed (Fig. 1) where the pointer is shown elevating with his left hand and training with his right. For firing at night electric lamps throw beams on the points of the fore and breech sights, the intensity being regulated as may be desired by a double rheostat commutator. A small hand pump serves at the same time for refilling the brake cylinder, and for putting the piece out of the firing position. The arrangements for sighting, including the fore and breech sights, are fixed on the cradle cylinder, and do not move when the gun recoils, allowing thus of the pointer keeping his eye constantly in the line of sight, which is indispensable for rapid fire.

The 65-millimeter gun mountings resemble the above, except that the recuperator or recovery cylinder is placed on the side of the cradle, and the training gear is dispensed with, because training is effected by the shoulder of the pointer, or "No. 1," pressing against a long shoulder piece.

To sum up, the material is very simple and thoroughly carried out. The movements are easy and well adapted for quick fire. Further, a glance at the carriages shows that they are less cumbrous and more compact than carriages of the same system of earlier type.

Fig. 1.

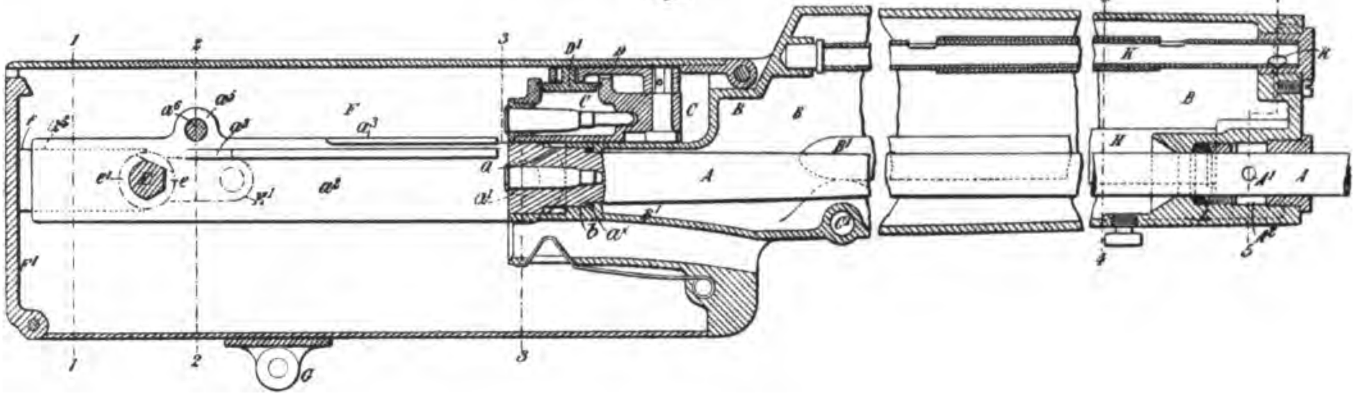
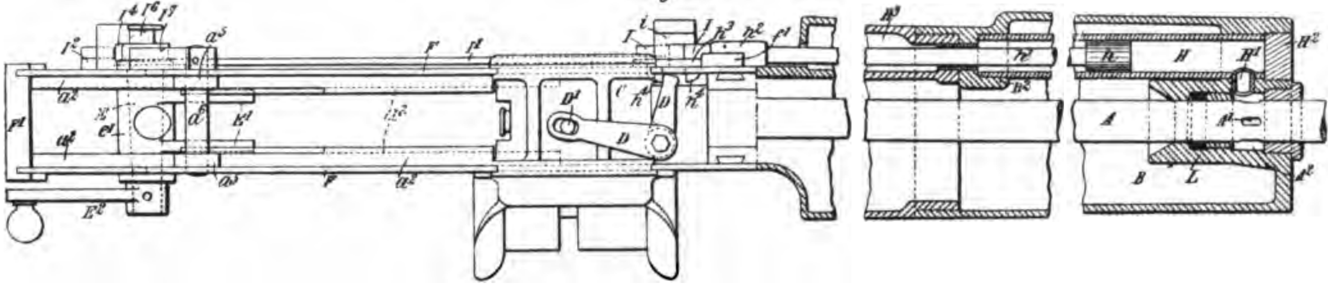


Fig2.



IMPROVED MAXIM AUTOMATIC GUN.

Fig. 3.

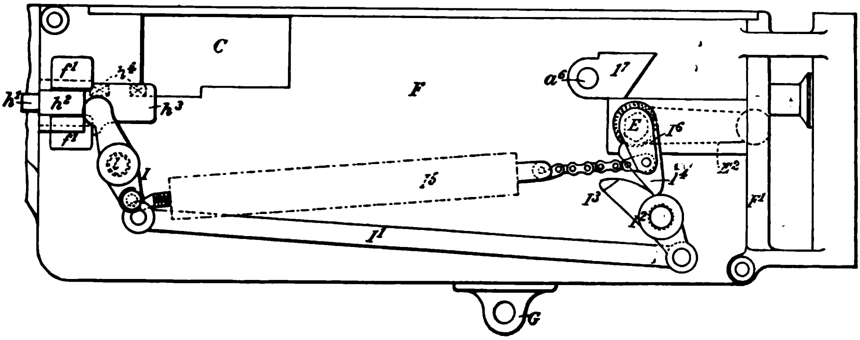


Fig. 4.

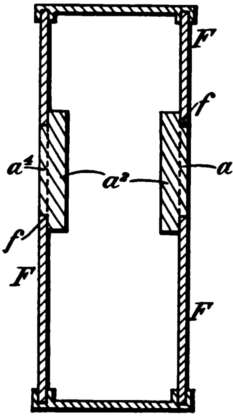


Fig. 5.

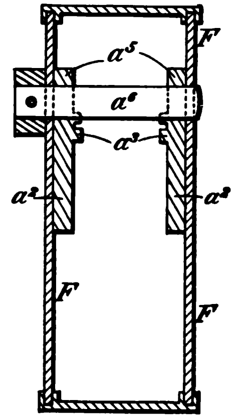


Fig. 6.

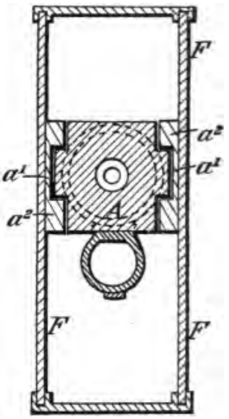


Fig. 7.

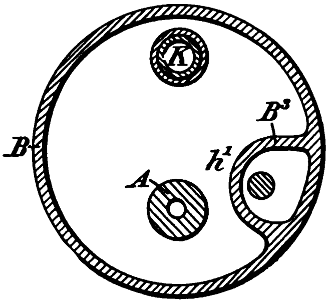
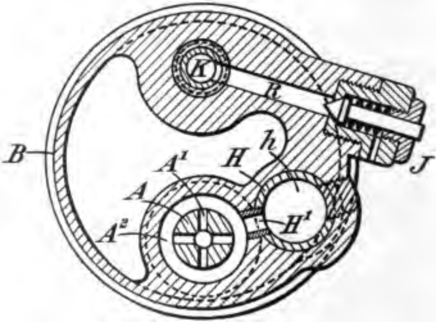


Fig. 8.



IMPROVED MAXIM AUTOMATIC GUN.

Fig. 9.

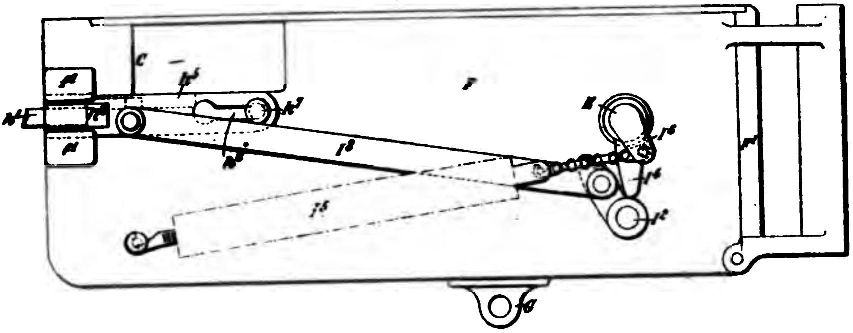


Fig. 10.

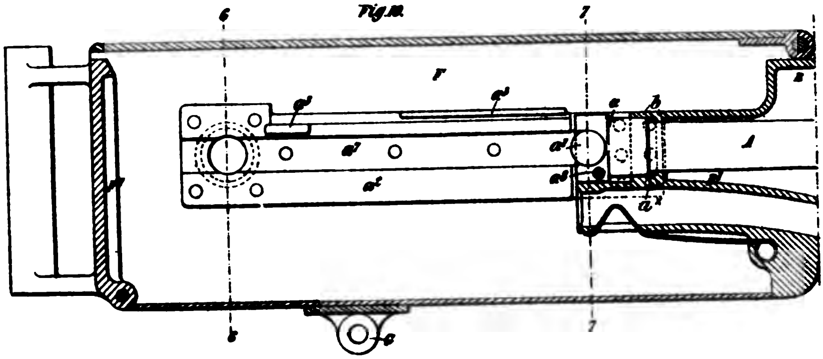


Fig. 11.

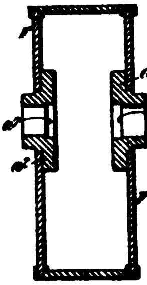


Fig. 12.

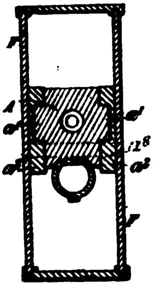
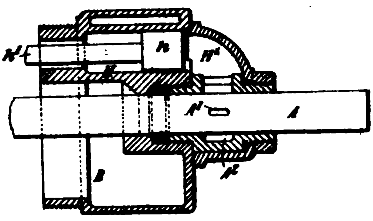


Fig. 13.



IMPROVED MAXIM AUTOMATIC GUN.

The view of the 10-centimeter gun (fig. 1) is a good illustration of the pointer keeping his eye on the line of sight while the piece is being loaded.

THE IMPROVED MAXIM AUTOMATIC GUN.

(English patent specification.)

The improved gun is similar to the old Maxim, but instead of arranging the barrel to recoil in the water jacket a nonrecoiling barrel is used, which is secured at each end of the water jacket by a water-tight joint.

A gas cylinder surrounded by a water jacket is used, provision being made for the admittance to this cylinder of a portion of the gases of discharge from the barrel, so as to actuate a piston within the said cylinder, and thereby operate the breech mechanism of the gun through the agency of suitably arranged levers and springs.

The new barrel may be fitted to the gun without disturbing the gas cylinder and its connections.

A valve is fitted to the water jacket, which allows the steam generated to escape only at a high pressure, thus avoiding the frequent blowing off, which occurs when allowed to escape at a low pressure.

Fig. 1 is a longitudinal section of the gun, the breech mechanism being removed.

Fig. 2 is a sectional plan.

Fig. 3 is a side elevation of the mechanism on the left-hand side of the gun.

Figs. 4, 5, 6, 7, and 8 are transverse sections, taken, respectively, on the lines 1 1, 2 2, 3 3, 4 4, and 5 5, of fig. 1.

Fig. 9 is a view similar to fig. 3.

Fig. 10 is a longitudinal section of the rear portion of the gun, showing manner of securing barrel.

Figs. 11 and 12 are transverse sections taken, respectively, on the lines 6 6 and 7 7 of fig. 10.

Fig. 13 is a detail sectional view of the muzzle end of the gun.

Like letters of reference indicate similar parts in all the above figures.

A is the barrel; B, water jacket; C, feed box; D, oscillating lever for operating the cartridge feed; E, crank shaft; E′, crank; E^2, crank arm outside the gun; F F, the two side plates of the casing inclosing the breech mechanism; F′, the hinged rear plate; G, lugs to which the elevating device is connected; G′, a transverse aperture to receive the trunnion pin.

The barrel A is formed near its breech end with a shoulder *a*, which is adapted to fit into a correspondingly shaped socket *b*, in a neck or rearward extension B′, with which the water jacket is provided. The barrel is also provided near its breech end with lateral projections or studs *a′ a′*, which fit into corresponding cavities formed in a pair of side bars a^2 a^2. (*See* fig. 6.) These side bars are furnished with guides a^3, by which the breechblock or lock is guided in its reciprocating movements.

The rear ends of these bars a^2 are increased in thickness to form rectangular blocks a^4, which enter end slots f (figs. 1 and 4) in the side plates F. A lug a^5 is formed on each bar a^2. A transverse pin a^6, passing through this lug, prevents any longitudinal movement of the side bars.

The crank shaft E is taper, and passes through openings in the side bars a^2, when these latter are in place. This tapered shaft is formed with flat portions e, and the hole in the sleeve e' of the crank E′ is similarly shaped, so that when the said shaft is passed through the sleeve, the crank becomes keyed to the shaft.

Near the muzzle of the barrel is formed one or more transverse openings A′, through which some of the gases escape at each discharge, entering the gas cylinder H. Within the gas cylinder is a piston h on the piston rod h'. The rear end of the piston rod is enlarged, h^2, which works between guides f' on the left hand side of the plate F. This end of the rod is also provided with a flat extension h^3, having lugs h^4 projecting from the inner surface.

The outer end of the feeding lever D enters between these lugs, and is thus actuated when the piston rod moves, thereby operating the feed plate D′ (figs. 1 and 2) to carry the cartridge belt through the feed box.

I (fig. 3) is an oscillating lever pivoted at i to the left-hand side plate F. The upper end of this lever bears against the enlargement h^2 on the piston rod, and its lower end is connected by a rod I′ to a tappet I^2.

In the discharge the gases entering the cylinder H act on the piston, and the rod h' is forced backward causing the curved portion I^3 of the tappet to bear against an arm I^4 on the crank shaft, turning the shaft and stretching a spiral spring I^5, one end of which is connected to the lower arm of the lever I, and the other end to a fuse I^6, carried by the crank shaft. I^7 is a stop which lies in the path of the arm I^4 and limits the extent of the crank shaft's rotation. The reaction of the spring I^5 closes the breech and returns the piston h to its firing position.

J (fig. 8) is a valve on the water jacket.

THE GUN EXPLOSION ON BOARD THE SISSOI VELIKI.

A terrible accident occurred on board the Russian battleship *Sissoi Veliki* on the 15th of March, while the ship was engaged at target practice outside of Suda Bay.

The *Sissoi Veliki* has four 12-inch Aboukoff guns of L/40, mounted in pairs, in balanced turrets—one turret being forward and the other aft.

The system of breech closure (Aboukoff) is a modification of the Canet principle. The continuous motion of a crank turns, withdraws, and swings the plug clear. The position of a sleeve on a vertical spindle shows whether or not the breech plug is locked.

Unfortunately, the position of this sleeve for the locked condition is not the same for both guns, being at the bottom of the spindle for one gun and at the top for the other. No safety device to prevent the guns being fired before the breech plug is locked is fitted. It is readily seen how a mistake could be made. The sleeves being in the same position on both guns, one breech plug would be locked, while the other would be simply closed and would lack the one-sixth of a turn necessary to engage the screw threads.

The starboard gun of the after turret was fired with the breech plug unlocked. The plug was blown out, and, striking the after wall of the turret, made a deep indent. The roof of the turret was composed of two plates, one 0.47 of an inch thick and the other 2 inches thick. This, being the weakest portion, was torn off and split into two pieces. One fragment fell into the water astern of the ship and did no damage. The other fragment was blown over the mainmast, struck the after rail of the bridge, and fell to the deck, killing 15 men, who happened to be standing there watching the practice. A reduced charge of 208 pounds of brown powder was used, and it is thought that if a full charge had been used the fragment would have passed entirely over the ship.

The turret was trained on the port beam at the time.

The guns were uninjured, but the turret was thrown about 0.98 of an inch out of line on its major axis and about 0.43 of an inch out of line on its minor axis. Eight of the 13 men who were in the turret at the time were killed.

TORPEDOES, TUBES, AND FITTINGS.

ABOVE-WATER TORPEDO TUBES.

It is stated on good authority that the Admiralty have decided to discontinue the practice of fitting ships with above-water discharges for Whitehead torpedoes. France also has greatly reduced the number of above-water tubes supplied for her latest ships. It has been pointed out that a serious disaster would happen on board a ship if her above-water tube, containing a loaded Whitehead torpedo, should be struck by a hostile projectile. When torpedoes were first introduced into the service, submerged tubes were not thought of, and as at that time no R. F. guns were in use there was little risk in trusting to above-water tubes as a means of torpedo discharge. Now, however, every war ship of importance, of whatever nationality, is furnished with dozens of R. F. guns, from which a continuous fire would be kept up in close action, and there is every probability of an enemy's torpedo tubes being selected as the most desirable objects at which to fire. The weight of gun cotton in each torpedo varies, according to the size and type of the weapon, from 60 pounds to 330 pounds, and the explosion of such a charge would cause greater destruction if it took place in a torpedo tube than if fired against the hull of a ship. It has also been found by experience that torpedoes thus discharged are far less reliable than those fired from submerged tubes, in consequence of the dive which the former have to take before getting in line with the object aimed at. It is not all ships that can be fitted with submerged tubes, as they require so much room for efficient working, but for some time past they have been adopted for battleships and the larger type of cruisers.

NETS.

The latest French battleships are not to be fitted with torpedo nets, and the older battleships have been ordered to turn their nets, with all fittings, into store.

Nearly every nation possesses an efficient net cutter.

All torpedoes for French torpedo boats are fitted with net cutters.

THE NEW ELSWICK SUBMERGED TORPEDO TUBE.

(English patent specification.)

The apparatus consists of a fixed outer tube or casing closed by a door in rear, and fitted in front with a sluice valve. The outer tube contains another tube which receives the torpedo within it, the same being admitted by a door at the rear end of the inner tube. Between the two tubes, at their rear ends, an annular space is provided, terminating in front at a gland formed in the outer tube about midway of its length. The torpedo guide can travel longitudinally through this gland. Compressed gas from the combustion chamber enters the annular space between the tubes, and drives the torpedo guide containing the torpedo forward until it is arrested by a hydraulic buffer stop; so the torpedo guide is made to protrude from the casing. There is a valve upon the rear door of the torpedo guide by which the compressed gas may pass also into the interior of the torpedo guide, and the gas so admitted impinges upon the torpedo, drives it forward, and launches it upon its course.

There are grooves within the torpedo guide from end to end at the top and at the bottom, and corresponding ribs entering these grooves on the torpedo, extending a short distance along it at its greatest diameter.

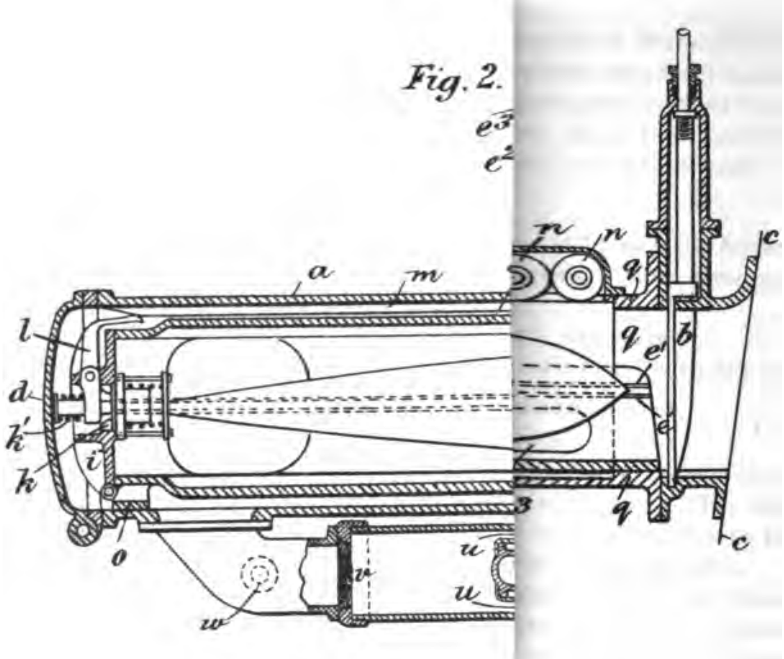
The fore part of the torpedo guide, which in the launching operation is protruded from the ship's side, is cut away on one side, forming a kind of trough; hence as soon as the ribs upon the torpedo are clear of the guiding grooves the torpedo is free.

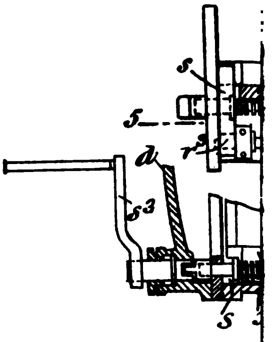
The gaseous pressure is generated in a chamber at the side of the casing and communicating with the annular space within.

To moderate the rush of gas resulting when the charge is exploded, the gas is checked by being made to pass through perforations in a plate and made to flow in a circuitous course. The gases exert a pressure on the rear of the guide, driving it forward.

The valve for admitting the gas to the interior of the torpedo guide is controlled by a cam surface, a spring, and a lever, so that the pressure applied within and without the torpedo guide may be duly proportioned.

Fig. 2.





Rollers are fitted upon the casing, to relieve the pressure upon the torpedo guide when the ship is moving through the water.

A screw is also provided to rig in the torpedo guide if it fails to return automatically.

Thus the guide is first ejected by the gas acting on it externally, then the gas is admitted into the guide and ejects the torpedo.

The valve is then closed automatically, and the return rush of water drives the torpedo guide inboard.

Fig. I, longitudinal horizontal section.

Figs. II and III, transverse sections.

Figs. IV and V show screw withdrawing gear, Fig. V being a section on line 5 and 5, Fig. IV. *a* is the outer tube or casing. *b* is a sluice valve at its forward end. *c* is a portion of ship's side to which the sluice valve is fixed. *d* is a door which closes the after end of the tube of casing *a*. This door is opened for the admission of the torpedo, and is closed and locked gastight behind it. *e* is the inner tube or torpedo guide. For half its length it is cylindrical and it is held in a gland formed in the casing at *f*. *g* (fig. I^a) is hand gear to adjust tightness of gland. e' e' are guiding grooves; *h*, torpedo. *i* is door at rear end of torpedo guide; it opens to admit the torpedo and closes water-tight behind it. *k* is a valve of large area mounted on the door *i*. A pair of hinges tend to hold the valve to its seat; the principal spring k' abuts upon a lever *l* at one end, upon a disk on the stem of the valve at the other end. *m* is a cam-like bar on which the lever *l* bears; it is fixed within the casing *a*. The lever *l*, when the torpedo guide travels forward within the casing, moves as it may be controlled by the inclines upon the bar *m*, and so the compression of the spring k' is made to vary and the valve is allowed to open more or less freely. e^2 is the fore part of the torpedo guide. The after part of this guide is cut away. e^3 e^3 are holes cut in the fore part of the torpedo guide. They allow the water to have access to the torpedo before it gets free of the guide. *n n* are rollers on the casing to support the torpedo guide. *t* is the combustion chamber.

OBRY'S ATTACHMENT FOR STEERING TORPEDOES.

This mechanism promises to give to the automobile torpedo an increased importance in warfare.

M. Obry, of Trieste, formerly of the Royal Navy, and now with the Whitehead Company of Fiume, patented the apparatus, which aims to limit, or to entirely do away with, the lateral deviations of the torpedo during its run. The mechanism is held secret, but the following is what is known about it: It is composed, first, of a gyroscope actuated by means of a spring—this spring is wound up by a key before the torpedo is placed in the tube and is released at the moment of firing; second, of a servo motor controlled by the gyroscope, and third, of two vertical movable rudders, which replace the two fixed rudders now used.

If from any cause, interior or exterior, the torpedo is deflected, the plane of the axis of the gyroscope is changed, causing the servo motor to act and the rudders to be moved so as to bring the torpedo back to its original direction. Thus, the horizontal projection of the trajectory described by the torpedo during its run will be a sinusoid. The weight of the apparatus is very small, and it can be readily fitted to all Whitehead torpedoes. One disadvantage of the mechanism is the loss of speed caused by the numerous changes of direction, but this is more than counterbalanced by the accuracy obtained.

Exhaustive experiments have been carried out by the Whitehead Company both from fixed platforms and from torpedo boats under way, and the results in all cases have been highly satisfactory. It is well known that ricochets with the surface of the water are prejudicial to accurate firing. To thoroughly test the mechanism torpedoes were fired in such a manner as to cause them to ricochet, and it was found that the torpedo was in no way deflected. Many foreign governments, notably France, Italy, Austria, and Japan, have secured the invention.

THE RUSSIAN POWDER (PYROCOLLODION).

The Russians have lately been experimenting with a new powder, called pyrocollodion, with remarkable results. This powder is the invention of Professor Mendeléyeff, who in 1890 established a laboratory in connection with the Russian admiralty for the purpose of experimenting with smokeless powders. Pyrocollodion is stated to be a new form of nitrocellulose, midway between ordinary gun cotton, which contains about 13 per cent of nitrogen, and collodion, which contains about 11½ per cent. Experiments were made in 1892 and 1893, the result of which has been its definite adoption in the Russian service.

At the armor-plate trials which took place at Okhta toward the latter end of 1895 the mean velocity on impact of six rounds fired from a 6-inch gun, with projectiles weighing from 87 to 88 pounds, was 2,580 foot-seconds. Two exceptional rounds were fired with velocities of 2,837 and 2,891 foot-seconds, and the ordinary muzzle velocity of this gun is now stated to be 2,600 foot-seconds.

In November last an 8-inch L/45 Russian naval service gun drove its projectile completely through one of Krupp's hardened 10-inch steel plates, the velocity on impact being 2,850 foot-seconds, and after passing through the plate 700 foot-seconds. The muzzle velocity of the principal Russian naval guns now using this powder has been brought up to 2,600 foot-seconds and more, as may be seen from the following table:

Caliber.	Length in caliber.	Weight of shell.	Muzzle velocity.
			Ft. secs.
12-inch	40	731	2. 750
10-inch	45	496	2, 700
4.72-inch		45	2, 600
2.953-inch		10. 75	2. 800
1.85-inch		3⅓	2, 300

ARMOR.

The English firms John Brown & Co., Cammell & Co., Vickers, and the French firm St. Chamond, have purchased the Krupp right of manufacture under the new cementing process. The cost of armor under this process will probably be higher than under the Harvey process. All English armor plate firms are now using nickel in their plates.

GREAT BRITAIN.

Firing trials of an experimental plate took place on board H. M. S. *Nettle* at Portsmouth on September 22, 1896. The plate was furnished by Messrs. Cammell, and was of Harveyed nickel steel of the following dimensions: 8 by 6 feet by 6 inches. The attack was with Holtzer's forged steel 6-inch projectiles weighing 100 pounds, I. V. 1,960 foot. seconds, striking energy 2,665 foot-tons. Five shots were fired. Figs. I and II show front and back views of plate. All shells were broken up, leaving their heads embedded in plate, the point of one projectile only getting through.

Firing trials of an experimental Harveyed nickel steel plate were held on board H. M. S. *Nettle* in July —, 1896. The plate was furnished by Messrs. John Brown & Co., Limited, of the Atlas Works, Sheffield, and was of following dimensions, 8 by 6 feet by 6 inches. Five 6-inch Holtzer projectiles weighing 100 pounds were fired, with full charge of 48 pounds E X E powder, giving an initial velocity of 1,960 foot-seconds. All projectiles were broken up, fragments of two only very slightly entering wood backing. Only one very slight crack was developed.

A successful trial of a Vicker plate took place on board the *Nettle* at Portsmouth, on the 19th of March, 1897. The plate was Harveyed nickel steel, containing 4 per cent of nickel, and was of the following dimensions, 8 by 6 feet by 6 inches. Caliber of gun 6 inches. Projectile, steel, A. P. Holtzer, weight 100 pounds. Charge 48 pounds E X E powder. I. V. about 1,960 foot-seconds. Distance of gun from plate 30 feet. Six shots in all were fired.

The first shot was delivered near the lower right-hand corner, fig. 1. The projectile broke up, leaving the point embedded and apparently fused into the plate. When the point was jarred out by the sixth shot, the depth of the indent was found to be 2¼ inches. There was slight scaling around the point of impact. At the back was a bulge 1⅝ inches high and 12 by 12 inches in area. One crack was developed. (*See* fig. 4.)

The second shot was delivered near the lower left-hand corner. (*See* fig. 2.) Results closely resemble those of shot No. 1.

The third shot was delivered near the upper left-hand corner, the shot breaking up in much the same manner as before. Depth of indent, 1¾ inches.

The fourth shot was delivered near the upper right-hand corner. (*See* fig. 3.) The general result was as before.

The fifth shot was delivered near the center. (*See* fig. 3.) The general result was as before.

This completed the proof test. At the request of the makers a sixth shot was delivered between shots 5, 2, and 1. (*See* fig. 3.) The same general effects were again produced, though they were rather greater. The surface of the plate was "driven in locally," and local cracking produced with irregular scaling about 2 inches deep. The bulge at the back was 1½ inches high and measured 13 inches and 14 inches across. (*See* fig. 4.)

FRANCE.

Firing trials of turret armor for the *Bouvet* were held on May 15, 1896. The plate was of nickel steel, surface hardened, by the Creusot process, and had the following particulars: Length, 8 feet 2.4 inches; breadth, 9 feet 3.2 inches; thickness, 14.9 inches; weight, 24.68 tons; caliber of gun, 13.39 inches.

Projectile, chrome steel A. P.; weight, 925.9 pounds. Two shots were fired. Shot No. 1: Charge, 233.7 pounds; velocity, 1,368 foot-seconds. (Fig. I.) Shot No. 2: Charge, 291 pounds; velocity, 1,571 foot-seconds. (Fig. II.) The first shot determined the acceptance of the lot and the second induced a premium of 5 per cent of the value of the lot.

A third shot fired at presumably a higher velocity smashed the center of the plate, leaving the sides standing alone.

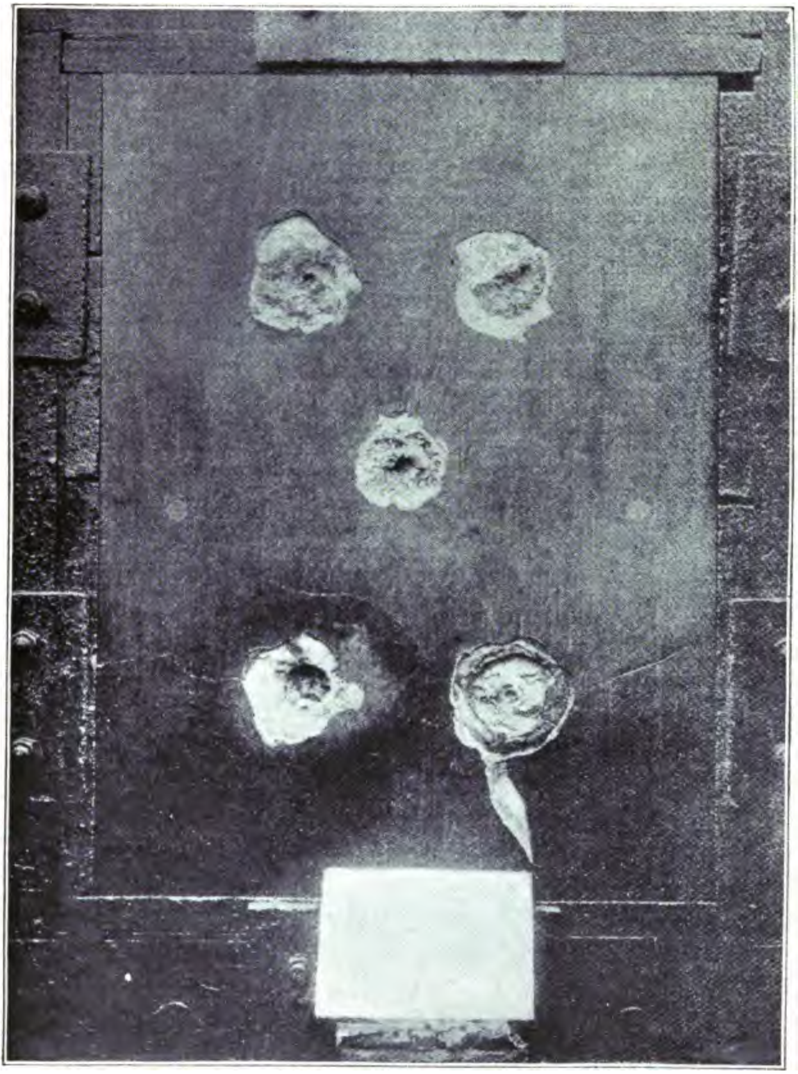
Firing trials of side armor for the *St. Louis* were held at the same time. The plate was nickel steel not surface hardened, and had the following particulars: Length, 15 feet 2 inches; breadth, 6 feet 6.3 inches; thickness, upper edge 14.1 inches, lower edge 5.5 inches; weight, 19.55 tons; caliber of gun, 9.45 inches.

Projectile, chrome steel A. P.; weight, 317.46 pounds. Two shots were fired. Shot No. 1: Charge, 79.37 pounds; velocity, 1,404 foot-seconds. Shot No. 2: Charge, 100.75 pounds; velocity, 1,624 foot-seconds. Thickness where shot No. 1 struck, 9.21 inches; thickness where shot No. 2 struck, 9.29 inches. The plate barely passed, if, indeed, it has been accepted. The projectile got through the plate sufficiently for its cylinder to project beyond the rear surface of the plate.

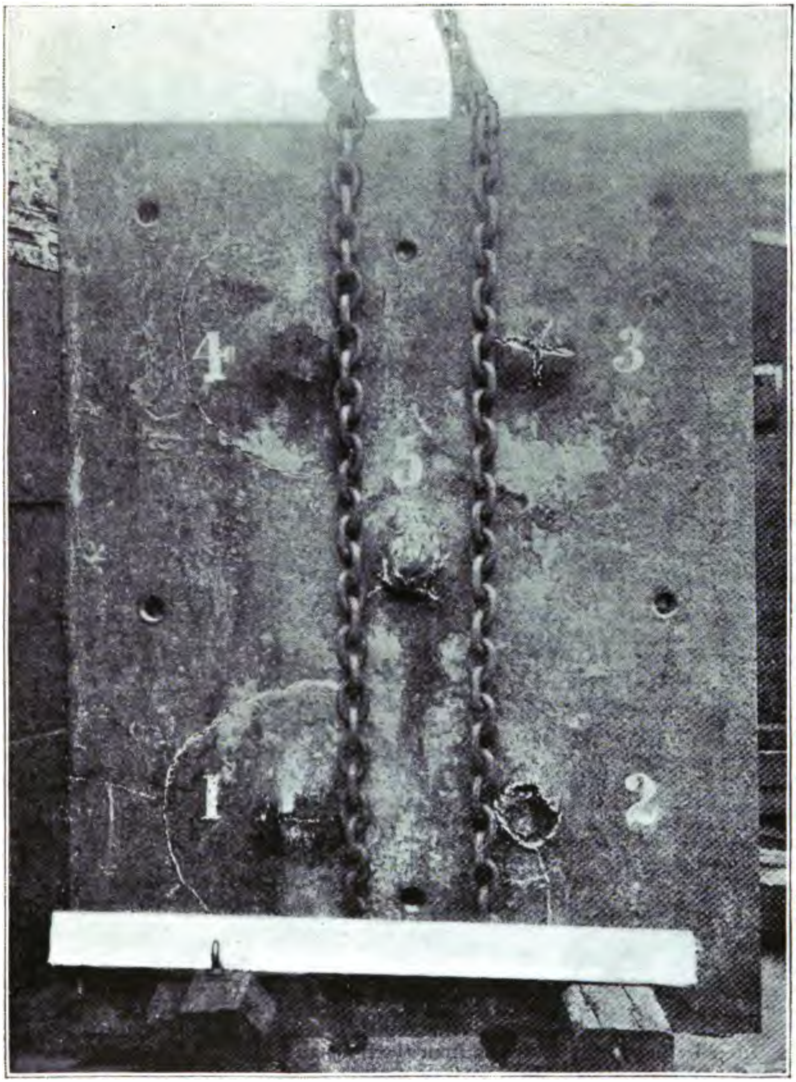
RUSSIA.

Firing trials of Krupp plates for the Russian navy were held August 28, 1896. Dimensions of plate 11.48 by 8.2 feet by 14.49 inches.

A number of surface cracks were noted in the plate before the trial; they did not widen or deepen during the trial. The plate was backed with wood and back of this was a thin plate. Caliber of gun 12 inches. Projectiles were of steel and of different qualities.



6-INCH HARVEY STEEL CAMMELL ARMOR PLATE. FRONT OF PLATE.



6-INCH HARVEY STEEL CAMMELL ARMOR PLATE. BACK OF PLATE.

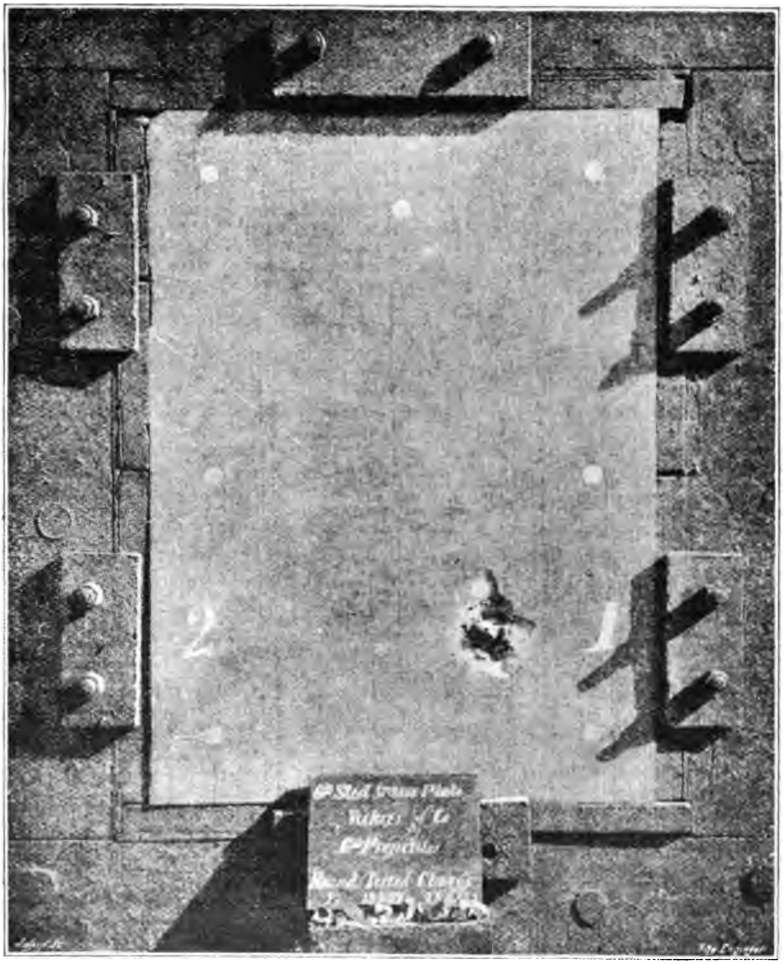


Fig. 1.—6-INCH STEEL ARMOR PLATE, VICKERS.

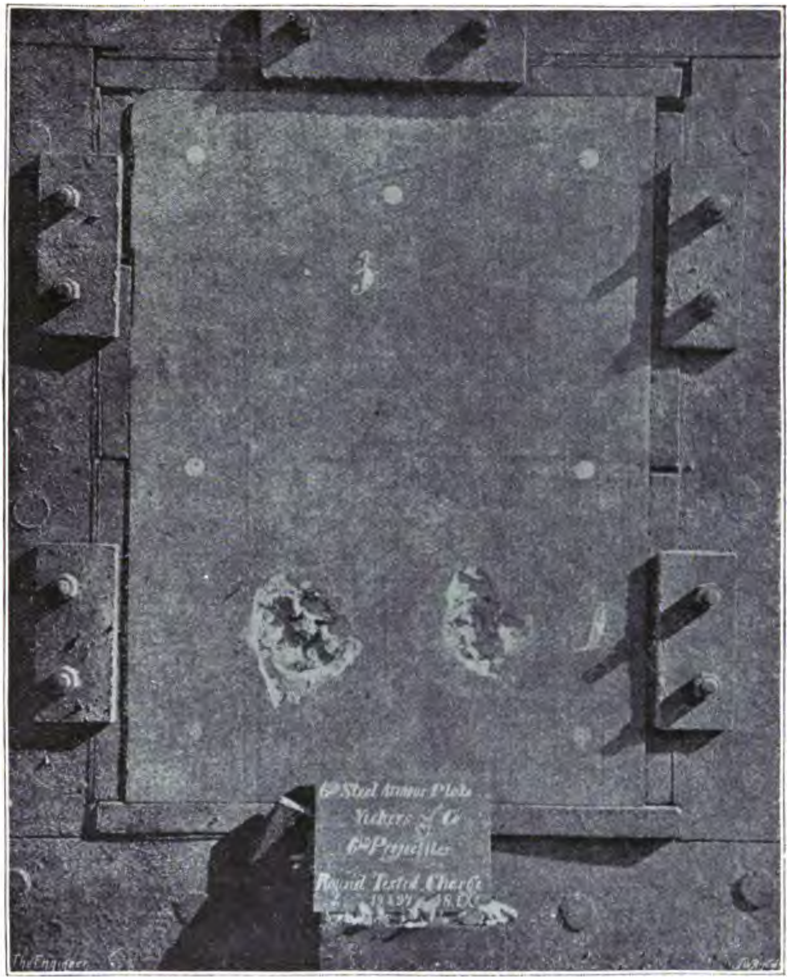


Fig. 2.—6-INCH STEEL ARMOR PLATE, VICKERS.

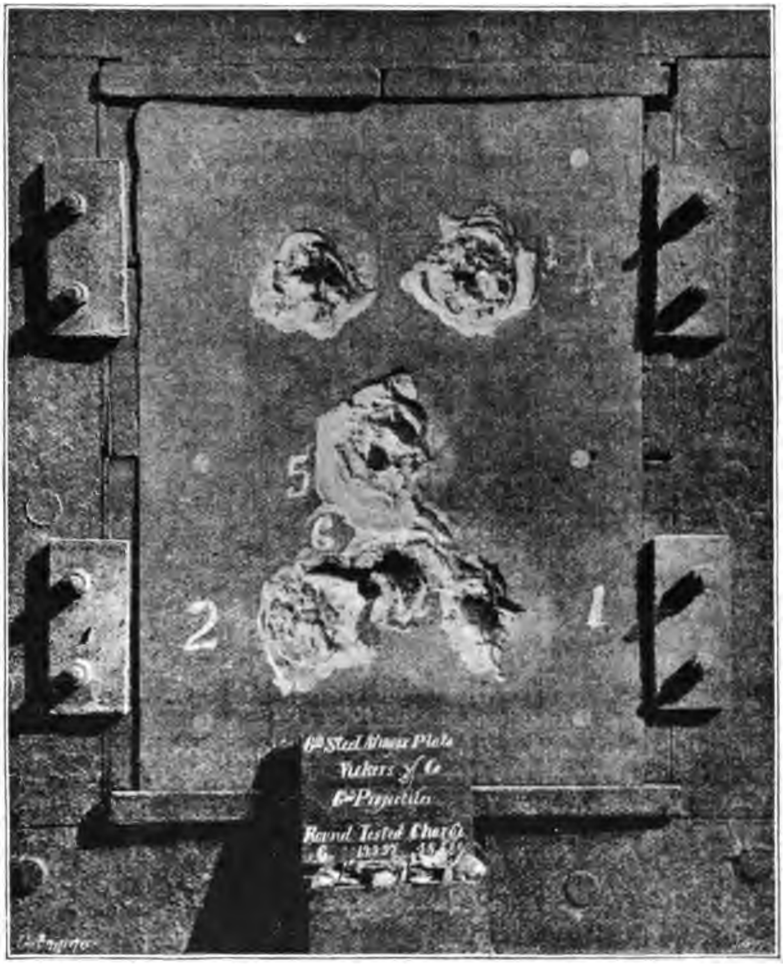


Fig. 3.—6-INCH STEEL ARMOR PLATE, VICKERS.

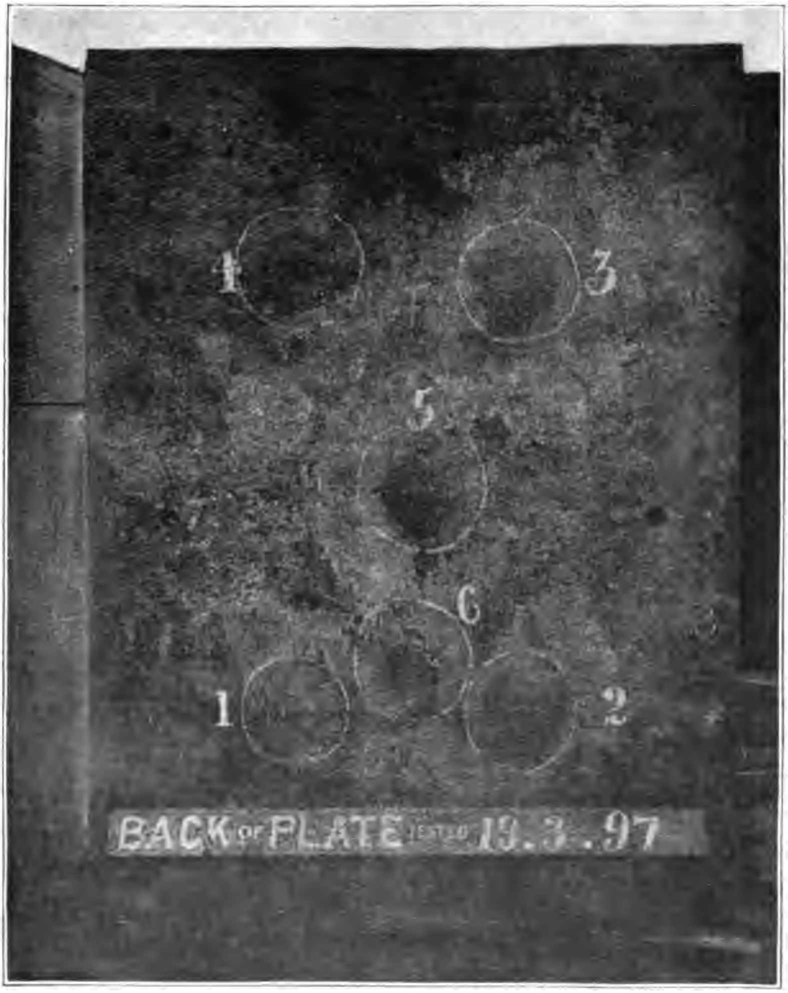
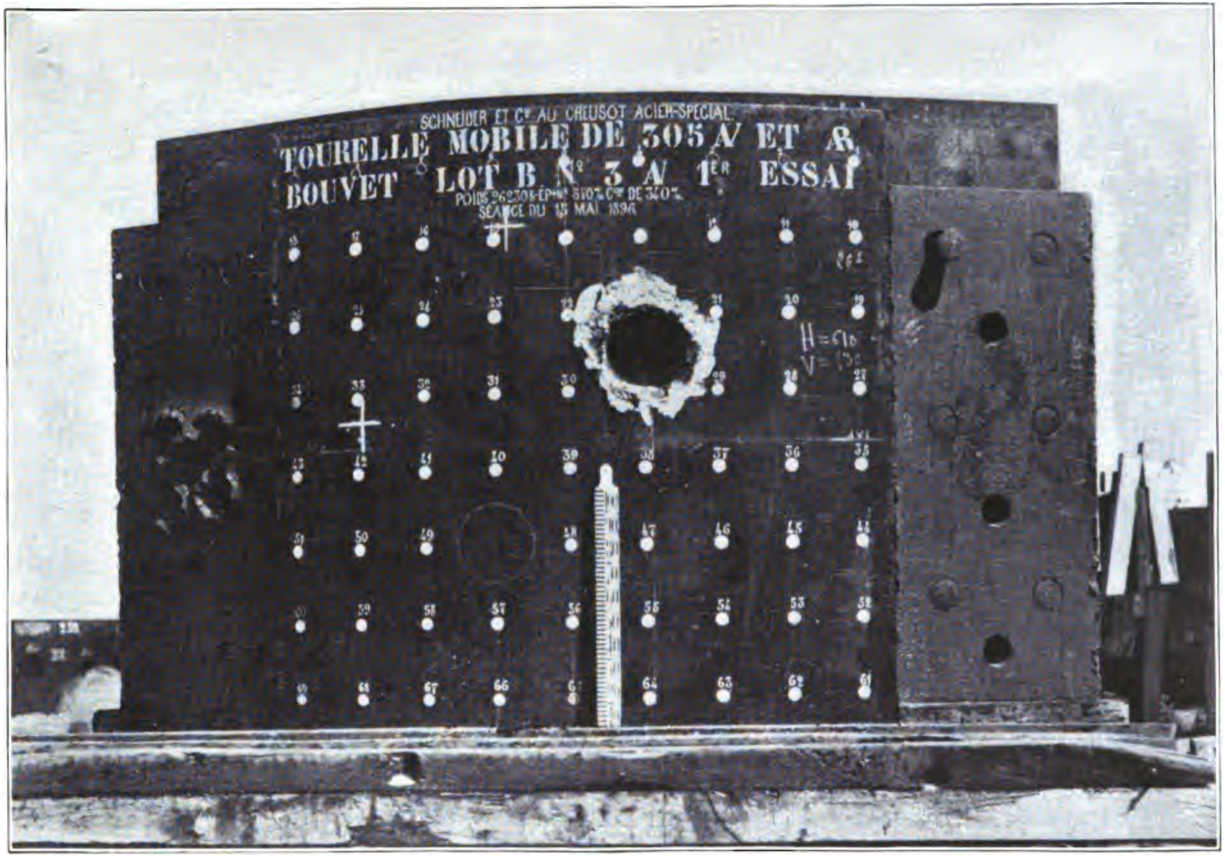
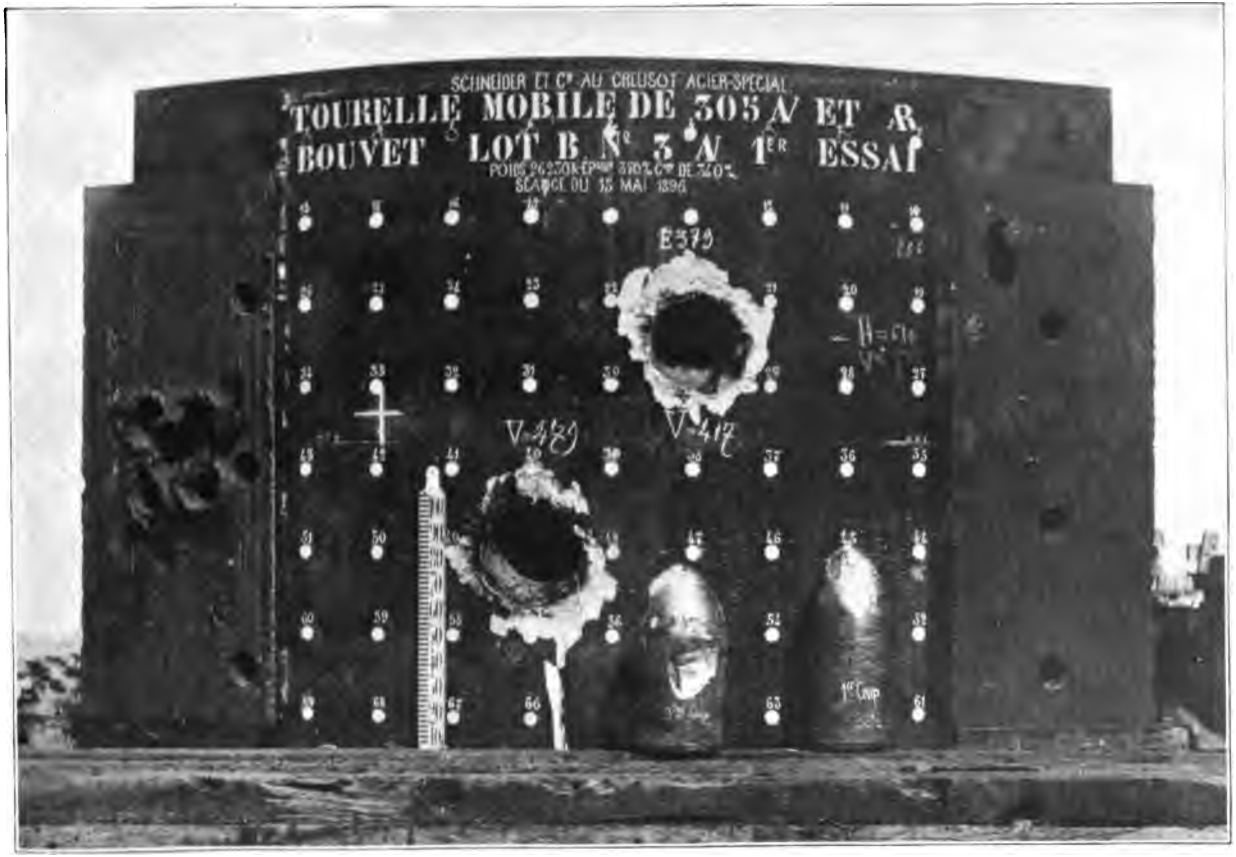


Fig. 4.—6-INCH STEEL ARMOR PLATE, VICKERS.


SCHNEIDER ET Cie AU CREUSOT ACIER-SPECIAL
TOURELLE MOBILE DE 305 A/ ET Æ
BOUVET LOT B No 3 A/ 1ER ESSAI
POIDS 26230K EPur 310% Cre DE 340%
SEANCE DU 15 MAI 1896
H = 610
V = 130

SCHNEIDER TURRET PLATE. FIRST ROUND.


SCHNEIDER ET Cie AU CREUSOT ACIER-SPECIAL
TOURELLE MOBILE DE 305 ⁝ ET Æ
BOUVET LOT B No 3 ⁝ 1ER ESSAI
POIDS 26230K EPRR 310% Cre DE 340%
SEANCE DU 15 MAI 1896
E379
V=429
V=417
1er Coup

SCHNEIDER TURRET PLATE. SECOND ROUND.

Shot No. 1. Weight of projectile 716 pounds. Velocity on impact 2,158 feet. Projectile broke up, leaving its head in the plate. The surface of the plate was dished all around the projectile. No cracks were developed.

Shot No. 2. Weight of projectile 718 pounds. Velocity of impact 2,157 feet. Same result as shot No. 1.

Shot No. 3. Weight of projectile 720 pounds. Velocity of impact 2,152 feet. Shot probably penetrated wood backing. No cracks were developed.

SWEDEN.

SMALL ARMS.

The new budget of the Swedish Government contains several items regarding arms. With regard to the 0.256-inch rifle, which has now been adopted, the requirements are estimated at 200,000 rifles. This is practically the Spanish Mauser rifle M/93 (p. 172, No. XIII), with the addition of a nose to the rear and top of the firing-pin nut and a rib on the bolt for guiding it in the receiver.

These are, as far as possible, to be manufactured within the country, part at the Government small-arms factory and part at private factories. The cost of the former is calculated at 56 kroner 90 öre ($15), and of the latter at 60 kroner 20 öre ($16) apiece. The manufacturing capacity of Sweden is at present about 25,000 rifles annually, of which the Government factory can manage 15,000, leaving 10,000 for private factories. A grant is now asked for enough to order at once 10,000 rifles annually for ten years.

THE NEW DUM-DUM BULLET.

Surg. Capt. G. S. Mansfield, medical staff, has drawn up an instructive report on the experiments with the special Dum-Dum bullet, carried out before the commander in chief in India, at Meerut, in December, 1896. These experiments, which were intended to demonstrate the amount of "set up" and "stopping power" in the bullet, were made, says the Times of India, on the carcasses of freshly killed sheep, tied up in various positions, some with the fleece on and others with the outer skin and fleece removed. Except in one instance the range was 200 yards, and the sheep were fired at broadside on, diagonally, and facing the shooter, in the last-named position the long axis of the body being exactly in line with the line of fire. The most remarkable result of the experiments was the large size of the "wound of exit" as compared with the smallness of the "wound of entrance." One bullet, fired at an unskinned sheep broadside on, passed between two ribs, making an entrance wound no larger than a big pea; but, after shattering one of the spinal vertebræ, it smashed two ribs and produced an exit wound as large as a crown piece. Another bullet, fired under similar circumstances, entered the abdomen behind the last rib, making a wound of entrance as large as a three-penny bit. On its exit a hole was torn in the opposite wall of the abdomen the size of a large orange. Yet another bullet fired at the same sheep pierced the lower jaw at its angle, making a hole in the skin no bigger than a pea, but on examination it was found that the bone was completely shattered. The report gives details of several other shots. One in particular may be noted—that in which the bullet, passing through the thigh, struck the pelvic bone, which apparently offered such resistance that an exit wound 2½ inches in diameter was the result. Surgeon-Captain Mansfield regards as particularly important the case of a bullet which entered through the front of the shoulder joint by a very small opening, and passing through the joint completely disorganized it. The articular ends of the two bones were smashed into over a dozen pieces, and there was great loss of substance. This wound may fitly be compared to a shot through a man's wrist or knee, and under similar conditions the bullet would be certain to immediately disable him, excision of the joint, or more possibly amputation of the limb, being the only remedy available. It does not require an expert's knowledge to perceive that such wounds, if inflicted on a human being, must necessarily put an effectual "stop" to his advance, even if they do not always prove fatal. The efficacy of the Dum-Dum bullet is specially vindicated by the character of the wounds, which only affected the soft parts. From these wounds Surgeon-Captain Mansfield infers that a bullet penetrating the muscular tissue only, such as that of the human thigh, will "set up" sufficiently to cause a severe wound, quite enough to effectually stop the progress of the man or the horse struck. It has been noted that all the shots except one were fired at a range of 200 yards. The exception was that of a shot fired at 50 yards from the animal. It struck the sheep's abdomen, soft parts alone being injured; yet, though the wound of entrance was small, the bullet on emerging tore a hole the size of an orange. This shot exemplifies beyond all reasonable doubt the superiority of the new bullet over the old one. Bullets manufactured by the new method do not produce clean-cut wounds at close range, as was the case with the old bullets, but are shown to possess an exceptional "stopping power."

◆

CANCELLED
JUN 2[illegible] 65 H
CANCELLED
CANCELLED
JUN 30 [illegible] H